Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DEA Reference number: 14/12/16/3/3/2/1034

February 2018

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Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of farm Gemsbok Bult 120, north-east of Kenhardt, Northern Cape Province

DRAFT EIA REPORT

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February 2018

Prepared for:
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REPORT DETAILS

Title:	**Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of farm Gemsbok Bult 120, north-east of Kenhardt, Northern Cape Province: SCOPING REPORT**
Prepared for:	This Draft Environmental Impact Assessment (Draft EIA) Report forms part of a series of reports and information sources that are being provided during the EIA Process for the proposed Skeerhok PV 2 project. In accordance with the 2014 NEMA EIA Regulations (as amended on 7 April 2017), the purpose of the EIA Report is to: • Present the details of and need for the proposed project; • Describe the affected environment, including the planning context, at a sufficient level of detail to facilitate informed decision making; • Provide an overview of the EIA Process being followed, including public consultation; • Assess the predicted positive and negative impacts of the project on the environment; • Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project; • Provide an Environmental Management Programme (EMPr) for the design, construction and operational phases of the project. The Draft EIA Report is being made available to all stakeholders for a 30-day review period. All comments on the Draft EIA Report (submitted within the 30-day review period) will be considered in the preparation of the finalised EIA Report. This finalised EIA Report will then be submitted to the National Department of Environmental Affairs (DEA), in accordance with Regulation 23 (1) of the 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 24 of the 2014 NEMA EIA Regulations (as amended, 2017).
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CONTENTS

EXECUTIVE SUMMARY

PROJECT OVERVIEW

juwi Renewable Energies (PTY) Ltd is proposing to develop three 100 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (132 kV transmission lines for each 100 MW facility) on Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult 120, and the connection points to the Eskom Nieuwehoop Substation on the Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province.

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2014 amended NEMA Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R327, R326, R325 and R324 on 7 April 2017, a full Scoping and EIA Process is required for the construction of each Solar PV facilities. A separate Basic Assessment Process will be undertaken for the development of the proposed transmission line and, associated electrical infrastructure to enable connection to the Eskom Nieuwehoop Substation. The Applicant has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the separate EIA and Basic Assessment (BA) Processes in order to determine the biophysical, social and economic impacts associated with undertaking the proposed development.

Since the proposed 100 MW Solar PV facilities are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process (PPP) will be undertaken for the proposed projects. However, separate Applications for Environmental Authorisation (EA) have been lodged with the Competent Authority (i.e. the National Department of Environmental Affairs (DEA)) for each proposed Scoping and EIA project and will be lodged for the BA project. Furthermore, separate reports (i.e. BA and Scoping and EIA Reports) will be compiled for each project. The Basic Assessment Report will be made available for Interested and Affected Party (I&AP) review with the EIA Reports.

The proposed 100 MW Solar PV facility projects (requiring a Scoping and EIA Process) are referred to as:

- Skeerhok PV 1;
- Skeerhok PV 2; and
- Skeerhok PV 3.

The proposed 132 kV transmission line project (requiring a BA Process) is referred to as:

- Skeerhok PV Transmission Line.

This Draft EIA Report only discusses the proposed **Skeerhok PV 2** project.

NEED FOR THE PROJECT

The Integrated Resource Plan for South Africa for the period 2010 to 2030 (referred to as "IRP 2010") was released by government in 2010, and proposes to develop and secure 17 800 MW of renewable energy capacity by 2030 (including wind, solar and other energy sources). The IRP was updated in 2013. The IRP 2010 has set up a target of 3 725 MW of renewable energy to be produced by Independent Power Producers (IPPs) by 2016. On 18 August 2015, an additional target of 6 300 MW to be procured and generated from renewable energy sources was added to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) as noted Government Gazette 39111. The additional target allocated for solar PV energy is 2 200 MW.

In 2011, the Department of Energy (DOE) launched the REIPPPP and invited potential IPPs to submit proposals for the financing, construction, operation and maintenance of the first 3 725 MW of onshore wind, solar thermal, solar PV, biomass, biogas, landfill gas or small hydro projects. The two main evaluation criteria for compliant proposals are price and economic development, with other selection criteria including technical feasibility and grid connectivity, environmental acceptability, black economic empowerment, community development, and local economic and manufacturing propositions. The bidders with the highest rankings (according to the aforementioned criteria) are appointed as "Preferred Bidders" by the DOE. The proposed projects aim to contribute to the above strategic imperative.

PROJECT DESCRIPTION

Linked to enhancing its operations within South Africa, the 100 MW Solar PV facility (i.e. Skeerhok PV 2) proposed by juwi will cover an approximate area of 300 hectares (ha). The site (farm) is a total of approximately 2000 ha. Due to the fact that this project only requires 300 ha of land, there is scope to avoid major environmental constraints through the final design of the facility within the development footprint.

The proposed project will make use of PV solar technology to generate electricity from the sun's energy. The Applicant is proposing to develop a facility with a possible maximum installed capacity of 100 MW Alternating Current (AC) of electricity from PV solar energy.

Once a Power Purchase Agreement (PPA) is awarded, the proposed facility will generate electricity for a minimum period of 20 years. It is proposed that juwi will implement the Self-Build Option for the additional electrical infrastructure to be constructed (which will be assessed separately as part of a BA Process)). Following the construction phase, the proposed transmission line will either be transferred into the ownership of Eskom or remain in the ownership of juwi.

The solar facility will consist of the following components:

- ***Solar Field:***
  - ≤250 ha Free Field Single Axis Tracker or fixed tilt PV – 114 MW DC;
  - Solar module mounting structures comprised of galvanised steel and aluminium;
  - below ground electrical cables connecting the PV arrays to the inverter stations, O&M building and collector substation; and

- Inverters and mini-subs.

- ***Collector substation:***
  - ≤1 ha 22/33 kV to 132 kV collector substation to receive, convert and step up electricity from the PV facility to the 132 kV grid suitable supply. The facility will house control rooms and grid control yards for both Eskom and the Independent Power Producer. A 32 m telecommunications tower (lattice or monopole type) will be established in the substation area;

- ***O&M area:***
  - Operations and Maintenance (O&M) buildings;
  - ≤1 ha hectare O&M laydown area (near / adjacent substation);
  - ≤0.01 ha solar measuring station;
  - Parking, reception area, offices, guest accommodations and ablution facilities for operational staff, security and visitors;
  - Workshops, storage areas for materials and spare parts;
  - Water storage tanks or lined ponds (~160 kl/day during first 3 months; ~90 kl/day for 21 months during rest of construction period; ~20 kl/day during operation);
  - Septic tanks and sewer lines to service ablution facilities; and
  - Central Waste collection and storage area.

- ***Battery Storage System:***
  - 100 MW Battery Storage Facility with a maximum height of 8m and a maximum volume of 1,120 m^3 of batteries (dangerous goods) and associated operational, safety and control infrastructure;

- ***Access road:***
  - ≤ 15 km long, ≤8 m wide gravel access road running from the transnet service road to the site

- ***Service roads:***
  - ≤10 km of ≤4 m wide gravel internal service roads within the plant boundary;

- ***Other infrastructure:***
  - Perimeter fencing and internal security fencing and gates as required.
  - Access control gate and guard house on access road;
  - ≤3.5 km length of small diameter water supply pipeline connecting existing boreholes to storage.
  - Stormwater channels

- ***Construction Site office area (used during construction and rehabilitated thereafter):***
  - ≤1 ha site office area;
  - ≤ 20 ha laydown area; and
  - ≤1 ha concrete batching plant

NEED FOR AN ENVIRONMENTAL IMPACT ASSESSMENT

As noted above, in terms of the EIA Regulations promulgated under Chapter 5 of the NEMA published in GN R327, R326, R325 and R324 in Government Gazette 40772, dated 7 April 2017, a full Scoping and EIA Process is required for the proposed project. The need for the full Scoping and EIA is triggered by, amongst others, the inclusion of Activity 1 listed in GN R325 (Listing Notice 2):

- *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area, or, on existing infrastructure".*

Given that energy related projects have been elevated to national strategic importance in terms of the EA Process, the proposed project requires authorisation from the National DEA, acting in consultation with other spheres of government.

The purpose of the EIA is to identify, assess and report on any potential impacts the proposed project, if implemented, may have on the receiving environment. The Environmental Assessment therefore needs to show the Competent Authority, the DEA; and the project proponent, juwi, what the consequences of their choices will be in terms of impacts on the biophysical and socio-economic environment and how such impacts can be, as far as possible, enhanced or mitigated and managed as the case may be.

APPROACH TO THE EIA PROCESS

The Applications for EA for the Scoping and EIA Projects were submitted to the DEA via courier in September 2017, together with the Scoping Reports for comment. Appendix E of this EIA Report includes the proof of submission (i.e. courier waybills) of the Applications for EA and the Scoping Reports to the DEA. The DEA acknowledged receipt of the Scoping Reports and Applications for EA on 21/09/2017. DEA EIA Reference Numbers were assigned to each Scoping and EIA Project, as noted above.

The Scoping Reports were made available to Interested and Affected Parties (I&APs) and stakeholders for a 30-day comment period extending from Wednesday 20th September 2017 to Monday 23rd October 2017. The comments received from stakeholders during the 30-day review of the Scoping Report and were incorporated into the Final Scoping Report (where required), and the finalised Scoping Report was submitted to the DEA in November 2017, in accordance with Regulation 21 (1) of the 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 22 of the 2014 NEMA EIA Regulations, as amended. The DEA accepted the finalised Scoping Report and Plan of Study for EIA on 30 November 2017, which enabled the commencement of the impact assessment phase.

This Draft EIA Report is now being released to stakeholders for a 30-day review period. All comments received will be included in the finalised EIA Report, which will be submitted to DEA for decision-making. The EIA Report is available in the Kenhardt public library. An electronic version of this report is also available on the following project website: https://www.csir.co.za/environmental-impact-assessment. Written notifications, hard copies and/or CDs containing the document were sent to key stakeholders, including authorities.

The results of the specialist studies and other relevant project information are summarised and integrated into the EIA Report. Part B of this EIA Report includes an Environmental Management Programme (EMPr). The EMPr is based on the recommendations made by specialists for design, construction, operation and decommissioning of the proposed project.

IMPACT ASSESSMENT AND MANAGEMENT ACTIONS

The specialist studies and statements conducted to inform this impact assessment are listed below. All impacts identified and assessed, as well as the proposed mitigation measures and management actions can be found in Chapter 6 and 7. In addition, all the mitigation and management measures proposed by the specialists, including those additional impacts and management measures identified by the EAP have been included in the EMPr (Part B of this Draft EIA Report).

Table 1: Specialist Studies and Statements

Specialist Studies and Statements conducted for the proposed Skeerhok PV 2 Project		
NAME	**ORGANISATION**	**ROLE/STUDY TO BE UNDERTAKEN**
Simon Bundy	Sustainable Development Projects (SDP)	Ecological Impact Assessment (including Terrestrial and Aquatic Ecology)
Jon Smallie	Wild Skies Ecological Services	Avifauna Impact Assessment
Luanita Snyman-Van der Walt	CSIR	Visual Impact Assessment
Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
EXTERNAL REVIEWERS		
Christo Bredenhann	WSP	Review of the Traffic Impact Statement compiled by the CSIR using existing studies in the project area.
Rudolph du Toit	Applied Science Associates (Pty) Ltd	Review of the Social Impact Statement compiled by the CSIR using existing studies in the project area.
Johann Lanz	N/A	Review of the Soils and Agricultural Impact Statement compiled by the CSIR using existing studies in the project area.
Andrea Gibb	SiVEST	External review of the VIA

An Impact Statement for Agriculture, Traffic and Social was also compiled by the EAP and is included in Appendices N1 – N3 of this Draft EIA Report. These statements were externally reviewed (as described in Table 1 above) and a letter of confirmation of this is included in each statement. It must be noted that the statements serve as a general description of the existing and predicted impacts associated with the proposed project (using information from existing studies in the area) and does not classify as a specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations (as amended on 7 April 2017). Furthermore, the statements considered the full development (i.e. the development of the three Solar PV Facilities (i.e. Skeerhok PV 1, 2 and 3) and the associated electrical infrastructure (which subject to a separate BA Process).

In addition, a Radio Frequency Interference (RFI) Survey Technical Study was commissioned by the Project Applicant to determine the impact of the proposed project on the SKA. This report is not a standard specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations, as it is a detailed, technical report which provides a cumulative topographical analysis of the proposed PV projects in the

Astronomy Geographic Advantage Area and was undertaken to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project. The full RFI study can be found in **Appendix P**, and comment from SKA on the proposed Skeerhok PV 1, 2 and 3 projects can be found in **Appendices G and O.**

The table below (Section 7.1, Chapter 6) summarises the overall significance of the impacts following the implementation of the recommended mitigation and management measures. **From this table it can be seen that no negative impacts of high significance are anticipated to occur as a result of this project provided the stipulated management actions are implemented effectively.**

IMPACT ASSESSMENT SUMMARY		
Specialist Study	**Overall Impact Significance Before Mitigation or Enhancement**	**Overall Impact Significance After Mitigation or Enhancement**
Ecological and Hydrological Impact Assessment	Negative: Very Low	Negative: Very Low
Palaeontology/Archaeology/Heritage Impact Assessment	Negative: Low	Negative: Very Low
Visual Impact Assessment	Negative: Moderate	Negative: Low
Avifauna Impact Assessment	Negative: Moderate	Negative: Low
Soils and Agricultural Potential Impact Statement	Negative: Very Low	Negative: Very Low
	Positive: Very Low	*Positive:* Very Low
Traffic Impact Statement	Negative: Low	Negative: Low
Social Impact Statement	Negative: Moderate	Negative: Low
	Positive: Moderate	*Positive:* Moderate

OVERALL EVALUATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Based on the findings of the specialist studies, which all recommend that the proposed project can proceed and should be authorised by the DEA, the proposed project is considered to have an overall **low negative environmental impact and an overall moderate positive social impact** (with the implementation of respective mitigation and enhancement measures).

The proposed project will take place within the Development Envelope. The location of the 300 ha PV facility within the assessed 400 ha Development Envelope will avoid the sensitive ecological and heritage features identified by the respective specialists. An indicative Site Development Plan within the Development Envelope has been produced and included within this report.

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 EIA 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 included in the EMPr (Part B of the EIA Report).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and supporting sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site. The findings of this EIA show that all natural resources will be used in a sustainable manner (i.e. this project is a renewable energy project and the majority of the negative site specific and cumulative environmental impacts are considered to be of low significance with mitigation measures implemented), while the benefits from the project will promote justifiable economic and social development.

Taking into consideration the findings of the EIA Process and given the national and provincial strategic requirements for infrastructure development, it is the opinion of the EAP that the project benefits outweigh the costs and that the project will make a positive contribution to steering South Africa on a pathway towards sustainable infrastructure development. Provided that the specified mitigation measures are applied effectively, it is recommended that the project receive EA in terms of the 2014 EIA Regulations (as amended on 7 April 2017) promulgated under the NEMA.

GLOSSARY

AC	Alternating Current
ADT	Average Daily Traffic
AGIS	Agricultural Geo-Referenced Information System
BA	Basic Assessment
BGIS	Biodiversity Geographic Information System
BID	Background Information Document
CA	Competent Authority
CBA	Critical Biodiversity Area
CPV	Concentrated Photovoltaic
CSP	Concentrated Solar Power
CSIR	Council for Scientific and Industrial Research
DAFF	National Department of Agriculture, Forestry and Fisheries
DEA	National Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DC	Direct Current
DM	Siyanda District Municipality
DMR	National Department of Minerals Resources
DOE	Department Of Energy
DOT	National Department of Transport
DSR	Draft Scoping Report
DWA	National Department of Water Affairs
EA	Environmental Authorization
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Protection Areas
FSR	Final Scoping Report
GA	General Authorization
GG	Government Gazette
GIS	Geographical Information Systems
GN R	Government Notice Regulation
HPM	Hydraulic Plant Module
I&AP	Interested and Affected Party
IEM	Integrated Environmental Management
ICB	Iron Chromium Battery
IDP	Integrated Development Plan
IPP	Independent Power Producer

IRP	Integrated Resource Plan
kWh	Kilowatt Hours
LSA	Later Stone Age
Mf	Friesdale Charkonite
Mja	Jacomys Pan Formation
Mks	Klip Koppies Granite
MSA	Middle Stone Age
MW	Megawatts
NBA	South African National Parks
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystems Protected Areas
NHRA	National Heritage Resources Act (Act 25 of 1999)
NPAES	National Protected Expansion Strategy
NWA	National Water Act (Act No. 36 of 1998)
PES	Present Ecological State
PPA	Power Purchasing Agreement
PV	Photovoltaic
REDZs	Renewable Energy Development Zones
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
S&EIR	Scoping and Environmental Impact Reporting
SABAP2	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standards
SANBI	South African National Biodiversity Institute
SARERD	South African Renewable Energy Resource Database
SDF	Spatial Development Framework
TDS	Total Dissolved Solids
ToR	Terms of Reference
WASA	Wind Atlas of South Africa
WMA	Water Management Area
WULA	Water Use License Application

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

PART A:

DRAFT EIA REPORT

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 1:

Introduction

CONTENTS

TABLES

FIGURES

KEY INFORMATION TO THIS APPLICATION

Table 1.1: Summary of Project Description

<table>
<tr><th>No.</th><th>Project aspect</th><th>Description</th></tr>
<tr><td>1</td><td>Description of the activity</td><td>juwi Renewable Energies Pty Ltd, “juwi” proposes the construction and operation of a ≤100 MWac solar energy facility (SEF) on Portion 9 of Gemsbok Bult Farm 120 and associated infrastructure, near Kenhardt in the !Kheis Municipality, in the Northern Cape Province.</td></tr>
<tr><td>2</td><td>Municipality</td><td>!Kheis Municipality</td></tr>
<tr><td>3</td><td>Applicant</td><td>juwi Renewable Energies (Pty) Ltd</td></tr>
<tr><td></td><td>Property details</td><td><table><tr><th>Farm Name</th><th>Farm No.</th><th>Farm Portion</th><th>Surveyor General 21 Digit Code</th></tr><tr><td>Gemsbok Bult Farm</td><td>120</td><td>9</td><td>C03600000000012000009</td></tr></table></td></tr>
<tr><td>4</td><td>Size of the site</td><td>Approximately property size is 2000 hectares (ha).</td></tr>
<tr><td>5</td><td>Development footprint</td><td>Approximately ~300 ha for the PV development (incl. associated infrastructure)
Area assessed ~ 400 ha</td></tr>
<tr><td>6</td><td>Capacity of the facility (in MWac)</td><td>≤100 MWac
100 MWh battery storage facility</td></tr>
<tr><td>7</td><td>Type of technology</td><td>A renewable energy facility comprising of numerous rows of PV (fixed or single axis) modules with associated support infrastructure to generate up to 100MWac electricity.</td></tr>
<tr><td>8</td><td>Structure heights</td><td>• Solar PV panels: approximately 5 m high
• Battery storage facility: approximately 8 m high
• Operations and Maintenance (O&M) buildings: approximately 8 m high
• Collector (on-site) substation approximately: 30 m high including a 32 m high telecoms tower
• On-site 132 kV transmission line: approximately 30 m above ground level</td></tr>
<tr><td>9</td><td>Type of grid connection (substation to which project will connect)</td><td>An overhead 132 kV transmission line will be constructed for the SEF and will extend between the proposed on-site substation and the Eskom Nieuwehoop Substation (to be assessed as part of a separate BA Process).</td></tr>
<tr><td>10</td><td>Other infrastructure (e.g. additional infrastructure, details of access roads, extent of areas required for laydown of materials and equipment, etc.)</td><td>• Perimeter fencing and internal security fencing and gates as required.
• Access control gate and guard house on access road;
• Small diameter water supply pipeline connecting boreholes to storage.
• Batching plant;
• Panel maintenance and cleaning area;
• Stormwater channels and culverts
• Laydown areas
• Access roads</td></tr>
</table>

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REGULATIONS REQUIREMENTS WITH REFERENCE TO RELEVANT SECTIONS OF THIS REPORT

The EIA process undertaken to date has culminated in the production of this Environmental Impact Assessment Report (EIAR). The EIAR provides information relevant to the project and establishes the potential impacts that were assessed in detail from the Scoping Phase, as well as a description of appropriate mitigation measures. This report has been prepared in accordance with the 2014 EIA Regulations, as amended, published in Government Notice No. R 326 of 7 April 2017 and associated guidelines promulgated in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998).

Error! Reference source not found. illustrates how the structure of the EIAR addressed applicable requirements for information in terms of 2014 EIA Regulations, as amended.

Table 1.2: Requirements of an EIA Report as defined in terms of Appendix 3 of GNR 326

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations, as amended (GN R326)	Section	Page
Appendix 3 - (1)(a)	Details of - i. the EAP who prepared the report; and ii. the expertise of the EAP, including a curriculum vitae;	Section 1.7 and Appendix A	Pages 1-30
Appendix 3 - (1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including - i. the 21 digit Surveyor General code of each cadastral land parcel; ii. where available, the physical address and farm name; iii. where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 1.1, 2.0 and 3.1	Pages 1-3, 1-8, 2-2 and 3-3
Appendix 3 - (1)(c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is - i. a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or ii. on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 2.0	Pages 2-2
Appendix 3 - (1)(d)	A description of the scope of the proposed activity, including – i. all listed and specified activities triggered; ii. a description of the activities to be undertaken, including associated structures and infrastructure;	Section 1.1, 2.1, 2.2, 2.3, 2.4 and 4.1	Pages 1-8 to 1-11, 2-2 to 2-14 and 4-4 to 4-6
Appendix 3 - (1)(e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	Section 4.2	Pages 4-7 to 4-14
Appendix 3 - (1)(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the	Section 1.5	Pages 1-15 to 1-28

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations, as amended (GN R326)	Section	Page
	context of the preferred location;		
Appendix 3 - (1)(g)	A full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including - i. details of all the alternatives considered; ii. details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; 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; iv. the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; v. the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified 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; vi. the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; 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; viii. the possible mitigation measures that could be applied and level of residual risk; ix. the outcome of the site selection matrix; x. if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and xi. a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 3.3, 4.4, Section 5.1, 6.1 - 6.12 and Section 7.3	Pages 4-16 to 4-17; 5-3 to 5-14; 6-3 to 6-15 and 7-3 to 7-6.
Appendix 3 - (1)(h)	A plan of study for undertaking the environmental impact assessment process to be undertaken, including - i. a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity; ii. a description of the aspects to be assessed as part of the environmental impact assessment process; iii. aspects to be assessed by specialists; iv. a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists; v. a description of the proposed method of assessing duration and significance;	Section 4.6	Pages 4-19 to 4-33

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations, as amended (GN R326)	Section	Page
	vi. an indication of the stages at which the competent authority will be consulted; vii. particulars of the public participation process that will be conducted during the environmental impact assessment process; and viii. a description of the tasks that will be undertaken as part of the environmental impact assessment process; ix. identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.		
Appendix 3 - (1)(i)	An undertaking under oath or affirmation by the EAP in relation to - i. the correctness of the information provided in the report; ii. the inclusion of comments and inputs from stakeholders and interested and affected parties; and iii. any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Appendix B	Page 1 to 3
Appendix 3 - (1)(j)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;	Appendix B	Page 1 to 3
Appendix 3 - (1)(k)	Where applicable, any specific information required by the competent authority;	Appendix H	Pages 5 to 26
Appendix 3 - (1)(l)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	Not applicable at this stage	N/A

CHAPTER 1. INTRODUCTION

This chapter provides an introduction (project overview) of the proposed Skeerhok PV 2 Solar Energy Facility, proposed on Portion 9 of Gemsbok Bult Farm 120 near Kenhardt in the Northern Cape. This chapter includes:

- An overview of the motivation or needs and desirability of the proposed PV Facility;
- Information on the Applicant;
- The appointed Environmental Assessment Practitioner (EAP) and the specialist team;
- Objectives of the EIAR; and
- The Requirements for an EIA in terms of Appendix 3 of the 2014 NEMA EIA Regulations, as amended (GN R326).

1.1. Introduction to the Proposed Development of a Solar Energy Facility

Juwi Renewable Energies (Pty) Ltd (hereinafter referred to as "juwi") proposes to construct and operate a 100 MWac Solar Energy Facility (SEF) and associated electrical infrastructure (subject to a separate Basic Assessment Process), on Portion 9 of Gemsbok Bult Farm 120 in the Northern Cape of South Africa. The project, referred to as **Skeerhok PV 2**, will be located approximately 70 km south of Upington and 43 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. The connection point is the existing Eskom Nieuwehoop substation located on Portion 3 of Gemsbok Bult Farm 120.

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, a full Scoping and EIA Process is required for the construction of the proposed Skeerhok PV 2 Facility. juwi has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the EIA Process in order to determine the biophysical, social and economic impacts associated with undertaking the proposed activities. Given that energy related projects have been elevated to national strategic importance in terms of the EIA Process, the proposed Solar PV Facility requires authorisation from the National Department of Environmental Affairs (DEA) as the Competent Authority (CA), acting in consultation with other spheres of government.

juwi intends to develop three Solar PV Facilities of 100 MWac each and associated electrical infrastructure (subject to a separate Basic Assessment Process) on Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult Farm 120 near Kenhardt in the Northern Cape. The three proposed projects are indicated in **Error! Reference source not found.** below. This EIAR only considers the proposed development of the Skeerhok PV 2 project (Figure 1).

Table 1.3: Three Preferred Solar PV Facilities proposed by juwi near Kenhardt in the Northern Cape

No	Solar PV Project	Project Site
1.	Skeerhok PV 1	Portion 0, Smutshoek Farm 395
2.	**Skeerhok PV 2**	**Portion 9 of Gemsbok Bult Farm 120**
3.	Skeerhok PV 3	Portion 0, Smutshoek Farm 395

Since the proposed 3 x 100 MW Solar PV Facilities are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process (PPP) has been undertaken for the proposed projects. However, three separate Applications for Environmental Authorisation (EA) were prepared and submitted to DEA. Furthermore, three separate Scoping Reports were prepared and submitted to DEA for decision-making. Refer to Appendix E of this EIA Report for the proof of submission (i.e. courier waybills). DEA acknowledged receipt and accepted the Scoping Report in a letter dated 30 November 2017. Three separate EIA Reports were prepared and are hereby submitted to DEA, as well as being sent out for Public Participation.

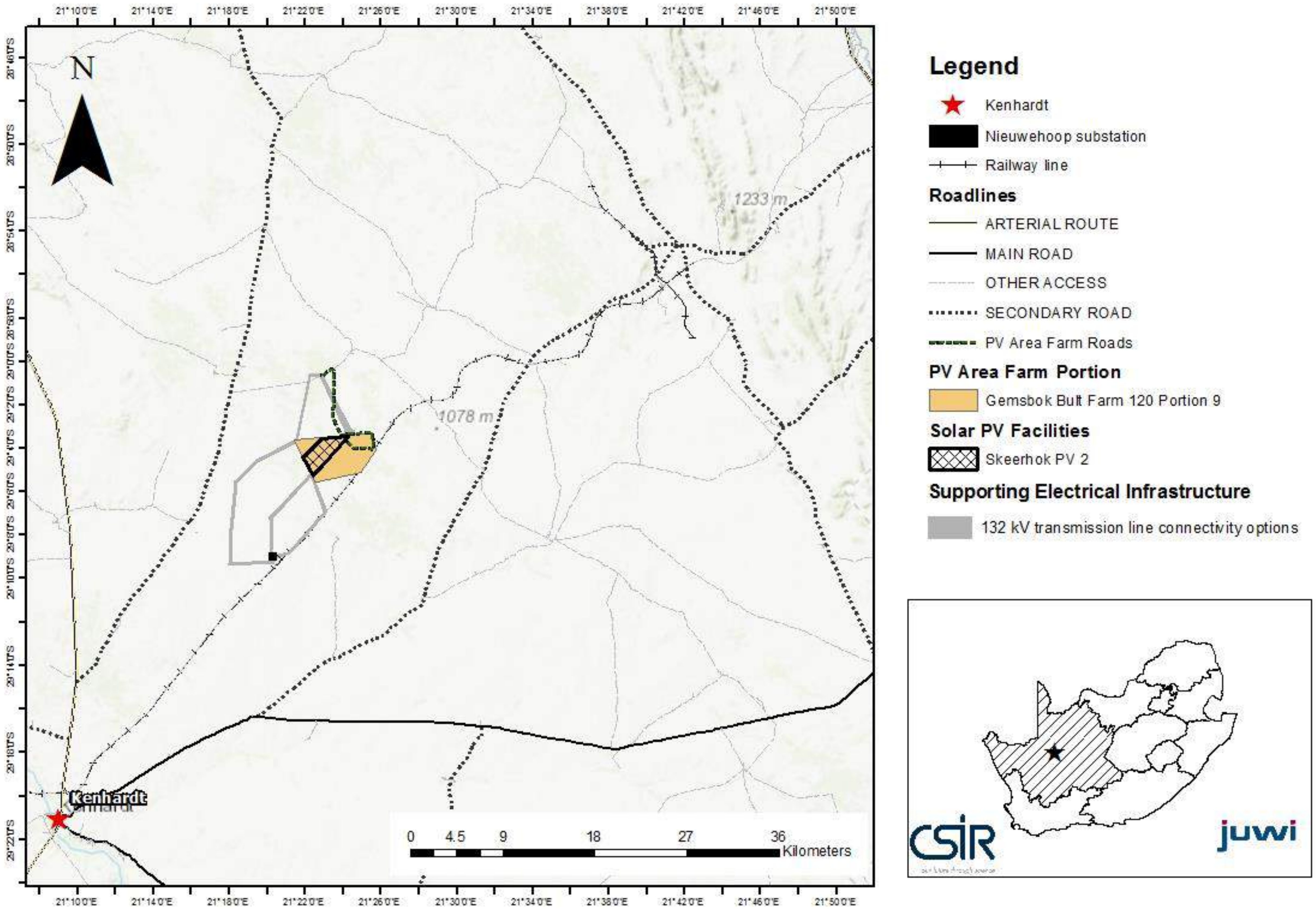

Figure 1.1: Locality map for the proposed Skeerhok Solar Photovoltaic 2 Facility near Kenhardt in the Northern Cape.

The proposed Solar PV Facility will require a development area of approximately ~300 ha. The project will comprise the following main components (which are discussed in more detail in the Project Description Chapter (Chapter 2) of this EIA Report and illustrated below):

- ***Solar Field:***
  - ≤250 ha of photovoltaic (PV) modules mounted on free field single-axis trackers or fixed tilt PV solar module mounting structures comprised of galvanised steel and aluminium; and
  - below ground electrical cables connecting the PV arrays to the inverter stations, O&M building and collector substation; and
  - Ring main units; and
  - Inverters and mini-subs.

- ***Collector substation:***
  - ≤1 ha 22/33 kV to 132 kV collector substation to receive, convert and step up electricity from the PV facility to the 132 kV grid suitable supply. The facility will house control rooms and grid control yards for both Eskom and the Independent Power Producer. A 32 m telecommunications tower (lattice or monopole type) will be established in the substation area;

- ***O&M area:***
  - Operations and Maintenance (O&M) buildings;
  - ≤1 ha O&M laydown area (near / adjacent substation);
  - ≤0.01 ha solar measuring station;
  - Parking, reception area, offices, guest accommodations and ablution facilities for operational staff, security and visitors;
  - Workshops, storage areas for materials and spare parts;
  - Water storage tanks or lined ponds (~160 kl/day during first 3 months; ~90 kl/day for 21 months during rest of construction period; ~20 kl/day during operation);
  - Septic tanks and sewer lines to service ablution facilities; and
  - Central Waste collection and storage area.

- ***Battery Storage System:***
  - 100 MWh Battery Storage Facility with a maximum height of 8m and associated operational, safety and control infrastructure;

- ***Access road:***
  - ≤ 15 km long, ≤ 8 m wide gravel access road running from the Transnet Service Road to the site

- ***Service roads:***
  - ≤10 km of ≤ 8 m wide gravel internal service roads within the plant boundary;

- ***Other infrastructure:***
  - Perimeter fencing and internal security fencing and gates as required.
  - Access control gate and guard house on access road;
  - ≤3.5 km length of water supply pipeline connecting existing boreholes to storage, alternatively water will be supplied by the local municipality.
  - Stormwater drainage

- ***Construction site office area (used during construction and rehabilitated thereafter):***
  - ≤1 ha site office area;
  - ≤ 10 ha laydown area; and
  - ≤1 ha concrete batching plant

The 100 MWac PV Facility will connect to the Eskom Nieuwehoop Substation located on the Portion 3 Gemsbok Bult Farm 120 via a 132 kV overhead transmission line (the development of the 132 kV line will be considered under a separate Basic Assessment process). EA for the construction of the 400/132 kV Eskom Nieuwehoop Substation was granted on 21 February 2011 by the DEA (DEA reference number: 12/12/20/1166). An EA (DEA reference number: DEA Reference Number: 12/12/20/2606; NEAS Reference Number: DEA/EIA/0000785/2011), dated 14 February 2014, granted authorisation 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
- 8 x 132 kV feeder bays and associated lines.

A maximum of 30 km of overhead line, connecting the on-site substation to the Nieuwehoop Substation is proposed.

A detailed project description (based on the conceptual design) is provided in Chapter 2 of this EIA Report.

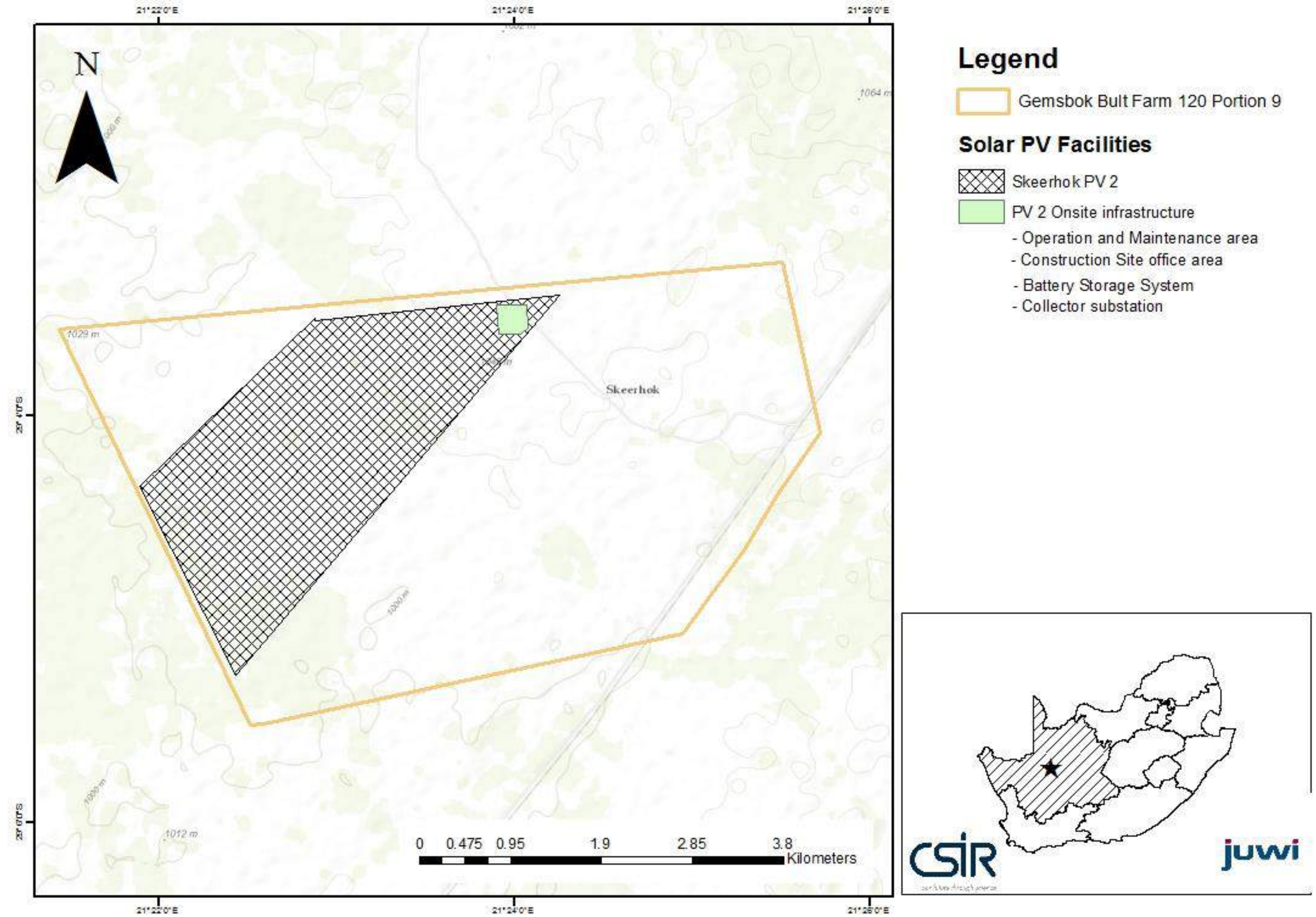

Figure 1.2: Plan locating the main components of the proposed Skeerhok PV 2 project on Portion 9 of Gemsbok Bult Farm 120

1.2. Requirements for an EIA

As noted above, in terms of the EIA Regulations, as amended, promulgated under Chapter 5 of the NEMA published in GN R326, R327, R325 and R324 on 7 April 2017, a full Scoping and EIA Process is required for the proposed project. The need for the full Scoping and EIA is triggered by, amongst others, the inclusion of Activity 1 listed in GN R325 (Listing Notice 2):

- "The development of facility 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 facility or infrastructure is for photovoltaic installations and occurs (a) within an urban area; or (b) on existing infrastructure".

Chapter 4 of this EIA Report contains the detailed list of activities contained in R327, R325 and R324 which may be triggered by the various project components and thus form part of the EIA Process.

The purpose of the EIA is to identify, assess and report on any potential impacts the proposed project, if implemented, may have on the receiving environment. The environmental assessment therefore needs to show the CA, the DEA, and the project applicant, juwi, what the consequences of their choices will be in terms of impacts on the biophysical and socio-economic environment and how such impacts can be, as far as possible, enhanced or mitigated and managed as the case may be.

1.3. Project Applicant and Project Overview

juwi Renewable Energies Pty Ltd is part of the international juwi Group, one of the world's leading companies in the area of renewable energy. juwi South Africa focuses on Solar and Wind Energy, and works with landowners, project developers, technology providers, regulators and investors to source and develop renewable energy projects. juwi acts as the project interface, coordinating the research and studies, the site identification, the project structure, environmental impact assessments, selecting the strategic partners, arranging financing, ensuring bid compliance and bidding under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) and reaching financial closure.

1.4. Project Motivation (Including Need and Desirability)

The need for renewable energy is becoming increasingly apparent, in both local and international context, with South Africa becoming an integral part of the global transition towards renewable sources of electricity generation. The urgency behind this evolution can be appreciated considering that South Africa is the largest emitter of greenhouse gases in Africa, accounting for as much as 42% of the continent's total emissions, and is also estimated to rank amongst the top 20 largest emitters of greenhouse gases in the world. These emissions are largely a result of an energy-intensive economy and high dependence on coal-based electricity generation. The South African government is therefore committed to supplementing the existing generation capacity of thermal and nuclear power plants with renewable energy power generation, thus creating the framework that will lead to an increase in the supply of clean energy for the nation.

South Africa is subject to some of the highest levels of solar radiation in the world with an average daily solar radiation that varies between 4.5 kilowatt hours per square metre per day (kWh/m^2 /day) and 6.5 kilowatt hours per square metre per day (kWh/m^2/day). This, in comparison to about 3.6kWh/m^2/day for parts of the United States and about 2.5kWh/m^2/day for Europe and the United Kingdom (Department of Energy, 2016), reveals that South Africa has considerable solar resource potential which should be exploited. On a provincial level, the Northern Cape is considered to be the best location for solar energy development in South Africa, due to its exceptionally high solar resource, flat and sparsely populated land, good transport, electricity grid infrastructure and the low population density. The average solar radiation in the Northern Cape ranges from 2200 kWh/m^2 per annum to 3200 kWh/m^2 per annum. On an annual scale, the Northern Cape received the most incoming solar radiation throughout the years (1980 to 2009), followed by North West and Free State. KwaZulu-Natal received least amount of mean monthly solar radiation in comparison with other provinces.

The Kenhardt area has an average solar radiation between 2200-2300 kWh/m^2/ per annum and is one of the best locations, within the Northern Cape for solar power generation. 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 solar radiation between 1500 kWh/m^2 and 1700 kWh/m^2 per annum, which is not completely feasible for solar energy projects.

The establishment of the proposed PV power generation facility would strengthen the existing electricity grid for the area. Additionally, the project would contribute towards meeting the national energy target as set by the Department of Energy (DoE) and assist the government in achieving its proposed renewable energy target of 17 800 MW by 2030.

Should the proposed site and development identified by juwi be acceptable, it is considered viable that long term benefits for the community and society in the Kenhardt area would be realised. The towns in the Northern Cape are generally small with limited job opportunities, and the proposed project will provide an opportunity for additional employment in an area where job creation is identified as a key priority. Approximately 1600 (600 direct and 1000 indirect) employment opportunities will be created during the construction period and 200 (50 direct and 150 indirect) employment opportunities will be created during the operation period of the proposed project.

The proposed project would also have international significance as it contributes to South Africa being able to meet some of its international obligations by aligning domestic policy with internationally agreed strategies and standards as set by the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, United Nations Convention on Biological Diversity (UNCBD) and the 2017 Paris Agreement, all of which South Africa is a signatory to. Renewable energy is critical to South Africa as this source of energy is recognised as a major contribution to climate protection, has a much lower environmental impact, as well as advancing economic and social development.

1.5. Need 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. **Error! Reference source not found.** includes a list of questions based on the DEA'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 Scoping and EIA Process.

Table 1.4: The Guideline on the Need and Desirability's list of 14 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 during the EIA phase of this project.** **The specialist identified all ecological sensitive areas on site that have 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.** **The sensitivity map is included in Chapter 3 of this Report.**
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 during the EIA phase of this project.** **The specialist identified all ecological sensitive areas on site that have 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.** **The sensitivity map is included in Chapter 3 of this EIA Report.** **Measures to avoid, remedy, mitigate and manage impacts are included within the compiled Environmental Management Programme (EMPr), included as Part B of the Report, which forms part of this EIA Report.**
1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise	**Measures to avoid, remedy, mitigate and manage impacts are included within the compiled EMPr, which forms part of this EIA Report.**

NEED	
Question	**Response**
and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether; what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	**Potential impacts associated with the proposed project, including waste generation are included in Chapter 6 of this EIA Report, as well as in the Environmental Management Programme included as Part B of this Report. Measures to avoid, remedy, mitigate and manage impacts are included within the compiled EMPr (Part B of the Report), which forms part of this EIA 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. A Heritage profile is included in Chapter 3 of this Report, as well as in Appendix K. The applicable measures to avoid, remedy, mitigate and manage impacts are included in Appendix K, as well as in the EMPr included as Part B of this EIA Report.**
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources 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?	**An Ecological Assessment has been undertaken with regards to the proposed project; the assessment includes a detailed profile of the natural environment and anticipated impacts. Measures to avoid, remedy, mitigate and manage impacts are included in the EMPr (Part B of this EIA Report).**
1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 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	**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 project is a sustainable option for the area and the proposed footprint will be placed to ensure avoidance and/or mitigation of any potential impacts to the receiving environment.**

NEED	
Question	**Response**
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?	
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.** **Current gaps in knowledge include the preferred technology to be used and the number of other solar facilities that will be constructed in the area. Ways in which these gaps are addressed is to consider all types of solar technologies as part of the assessment and to consider the cumulative impact of all solar facilities being developed within the area.**
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?	**This is considered and addressed as part of the desktop review of previous social assessments undertaken in the area for similar types of projects (included in Appendix N).** **An EMPr (Part B) has been compiled for the proposed project to ensure that all potential negative impacts identified are suitably managed and mitigated, and potential positive impacts are enhanced. The impact on the sense of place is difficult to predict and would potentially be ambiguous. This is due to the subjective nature of perceptions regarding the relative attraction or disturbance of the solar facility in a rural landscape. The visual impact has been assessed as part of the Visual Impact Assessment (Appendix M of this EIA Report).**
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	**This is considered and addressed as part of the desktop review of previous social assessments undertaken in the area for similar types of projects (included in Appendix N).**

NEED	
Question	**Response**
heritage site, opportunity costs, etc.)?	
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 proposed activity does not compromise any of the objectives set within the !Kheis Municipality Draft IDP (2012 – 2017 and 2015 – 2019). The proposed project will also be supportive of the IDP's objective of creating more job opportunities. The proposed solar energy facility will assist in local job creation during the construction and operation phases of the project (if an EA is granted by the DEA). However, as noted above, employment opportunities will be temporary during the construction phase and long-term during the operational phase as the plant is expected to be operational for 20 years.**
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?	**Please refer to Chapter 5 of this EIA Report.**
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	**Please refer to Chapter 6 of this EIA Report.**
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?:	

NEED	
Question	**Response**
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 Municipality Draft Integrated Development Plan (IDP) (2012 – 2017 and 2015 – 2019) 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. 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. Furthermore, the DEA have commissioned a Strategic Environmental Assessment (SEA) to identify the areas in South Africa that are of strategic importance for Wind and Solar PV development. The SEA aims to identify strategic geographical areas best suited for the roll-out of large scale wind and solar PV energy projects, referred to as Renewable Energy Development Zones (REDZs). The proposed solar facility falls within one of the potential eight REDZ areas. Therefore, should the REDZ be established and renewable projects operate within these areas, Eskom may be able to unlock funding to proactively construct grid infrastructure to facilitate generation capacity from these areas. This will mean that the municipality will also benefit from these upgrades and potentially alleviate the electrification backlogs present in the area.** **One of the priority issues identified within the !Kheis Municipality IDP (2012 – 2017 and 2015 – 2019) is the low levels of skilled people, as well as high levels of poverty and unemployment. The IDP (2012 – 2017 and 2015 – 2019) states that the objective to resolve this issue is to create an environment whereby the local community is empowered through capacity building and skills development (particularly for the youth). The proposed project will create job opportunities and economic spin offs during the construction and operational phases (if an EA is granted by the DEA). It is estimated that approximately 600 direct and 1000 indirect employment opportunities will be created during the construction phase. During the operational phase, approximately 50 direct and 150 indirect employment opportunities will be created. 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 SEF would help to address**

NEED	
Question	**Response**
	the need for increased electricity supply while also providing advanced skills transfer and training to the local communities and creating contractual and permanent employment in the area. **The proposed activity does not compromise any of the objectives set within the !Kheis Municipality Draft IDP (2012 – 2017 and 2015 – 2019). The proposed project will also be supportive of the IDP's objective of creating more job opportunities. The proposed Solar Energy Facility will assist in local job creation during the construction and operation phases of the project (if an EA is granted by the DEA).**
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.)	**The impact on sensitive natural areas would be limited. The larger 400 ha buildable area was considered and assessed by the specialists in order to ensure that any development constraints or sensitive natural areas are avoided in the final siting of the proposed facility. 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 K. Due to sensitive heritage features present on site, the site layout has been amended to avoid these features. Please see Chapter 3 for an amended site layout map including the avoided sensitive features.** **The preferred project site is currently being used for agricultural purposes, predominantly grazing. Should the proposed project proceed, approximately 300 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 Potential Impact Statement (Appendix N) was compiled using the extensive existing information available and is included within the EIA Report to reflect the impact of the proposed project in terms of the land use and agricultural potential.**

NEED	
Question	**Response**
	As noted, an EMPr was compiled for the proposed project to ensure that all potential negative impacts identified are suitably managed and mitigated, and potential positive impacts are enhanced. The impact on the sense of place is difficult to predict and would potentially be ambiguous. This is due to the subjective nature of perceptions regarding the relative attraction or disturbance of the solar facility in a rural landscape. The visual impact and considerations have been assessed in the Visual Impact Assessment which is attached as Appendix M. An environmental sensitivity map is included in Chapter 3, based on the input obtained from the various specialist studies. Where possible sensitive features have been avoided by layout revisions.
2.1.4. Municipal Economic Development Strategy ("LED Strategy").	**The 2012 !Kheis LED Strategy states that a great opportunity exists for the generation of green energy in the area, particularly solar energy, due to the area experiencing longer daylight hours, that is longer sunshine hours.**
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?	**This is addressed and included within the Social Impact Assessment (Appendix N).**
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	**This is addressed and included within the Social Impact Assessment (Appendix N).**
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?	**This is addressed and included within the Social Impact Statement (Appendix N).**
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,	**N/A the proposed project is located within a rural area and the site is zoned for agricultural use.**
2.5.2. reduce the need for transport of people and goods,	**N/A the proposed project is located within a rural area and the site is zoned for agricultural use.**
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	**N/A the proposed project is located within a rural area and the site is zoned for agricultural use. This project is a renewable energy project and not a transportation project.**

NEED		
Question		Response
	transport),	
2.5.4.	compliment other uses in the area,	**The preferred project site is currently being used for agricultural purposes, predominantly grazing. Should the proposed project proceed, approximately 300 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 Potential Impact Statement is included within the EIA Report (Appendix N) to reflect the impact of the proposed project in terms of the land use and agricultural potential.**
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,	**N/A the proposed project is located within a rural area and the site is zoned for agricultural use.**
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 the Transnet Service Road as an access road until the access road traverses the greater project area, i.e. enters farm Gemsbok Bult Portion 9.**
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,	**Not applicable as the project is not proposed in an urban area where social impacts are expected to manifest.**
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 EIA, the proposed project would not have a significant ("high") negative impact on the receiving environment, with the implementation of suitable mitigation measures. No impacts of high significance (with the implementation of mitigation measures) were identified in the EIA. As noted in Appendix N of this EIA Report (Soils and Agricultural Potential Impact Statement), due to the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing. Currently, the site is used for grazing, which could continue in the surrounding regions, together with the generation of additional income via the leasing of the land to the Applicant.** **It is also important to point out that the proposed project will be designed according to relevant national specifications and standards which are**

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Question	**Response**
	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.),	**Please refer to Chapter 2 for a description of the process undertaken to identify the site is a preferred site for a Solar Energy Facility**
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),	**This is addressed and included within the Social Impact Statement (Appendix N).**
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	**The impact of the proposed project on cultural/heritage areas (archaeology and palaeontology) was assessed and forms Appendix K of this EIA Report.**
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?	**Several SEFs are proposed in the area, which lends itself potentially to a renewable energy development area.** **The proposed solar facility falls within one of the potential eight REDZ areas. Therefore, should the REDZ be established and renewable projects operate within these areas, Eskom may be able to unlock funding to proactively construct grid infrastructure to facilitate generation capacity from these areas. This will mean that the municipality will also benefit from these upgrades and potentially alleviate the electrification backlogs present in the 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)?	**This is addressed and included within the Social Impact Statement (Appendix N).**
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:	

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Question	**Response**
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?	**This is addressed and included within the Social Impact Statement (Appendix N).**
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 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 PPP undertaken to date as part of the Scoping and EIA process is included in this EIA Report. Various methods have been employed to notify potential (I&APs) of the proposed project, namely, through adverts, site notices on site and in Kenhardt and notification letters.**
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	**The EIA process has taken cognisance of all interests, needs and values espoused by all interested and affected parties. Opportunity for**

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Question	**Response**
awareness, the sharing of knowledge and experience and other appropriate means,	**public participation will be provided to all I&APs throughout the EIA process in terms of the 2014 EIA Regulations, as amended.**
2.13.5. ensure openness and transparency, and access to information in terms of the process,	**The PPP undertaken to date as part of the Scoping is included in this EIA Report. This will be updated with the PPP undertaken during the distribution of the Draft EIA Reports. Various methods have been employed to notify potential (I&APs) of the proposed project, namely, through adverts, site notices on site and in Kenhardt and notification letters.**
2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	**The EIA process has taken cognisance of all interests, needs and values adopted by all interested and affected parties.**
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.	**Public participation of all I&APs has been promoted and opportunities for engagement will be provided throughout the EIA process.**
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	**The proposed project presents viable long term benefits for the community and society in the Kenhardt area. Recommendations made within the Social Impact Statement (included in Appendix N of this EIA Report) and those included in the EMPr section of this Report (Part B) have the potential to facilitate more options to local community members in terms of socio-economic benefits.**
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,	**This is addressed and included within the Social Impact Statement (Appendix N).**
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),	

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Question	**Response**
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 EIA Report has been informed by applicable integrated environmental management legislation and policies. Chapter of this EIA Report and the specialist studies included in this Report also provide a description of the relevant applicable legislation that the proposed development complies with.**
2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	**Public Participation has been undertaken as part of the Scoping Phase for this EIA process, and to this date the CSIR has not received information on potential conflicts of interest.**
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?	**Public participation forms an integral part of the Environmental Assessment Process and assists in identifying issues and possible alternatives to be considered during the EIA Process.**
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 (Part B) 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 (Part B) 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	**Due to both the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing. The site is within one of South Africa's eight proposed Renewable Energy Development Zones (REDZs), and has therefore**

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Question	**Response**
selection of the best practicable environmental option in terms of socio-economic considerations?	**been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors. These factors include an assessment of the significance of the loss of agricultural land. Renewable energy development is therefore a very suitable land use option for the site. The proposed solar energy facility would however be more robust in terms of economic viability and profitability while also being largely uninfluenced by climate change variables. The proposed project would also provide the farm owner with additional income by way of lease agreements (as explained above) and will also contribute to local socio-economic upliftment through job creation.**
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?	**In assessing the cumulative impacts of the proposed development, all the projects that fall within a 20 km radius of the proposed skeerhok projects were considered. The cumulative impact assessment also assumes that a total of six approved renewable energy developments will be approved for construction. The incidence and severity of the in-migration of job seekers and increases in social deviance are likely to increase with the development of more SEFs in the area. The cumulative socio-economic benefit offered by industrial scale development in the area outweighs the negative impacts associated with economic growth. The cumulative impact of the proposed development is therefore considered to be of moderate significance.**

1.6. EIA Team

As previously noted, the CSIR has been appointed by juwi to undertake the EIA required for the proposed project. Public participation forms an integral part of the EIA Process and assists in identifying issues and possible alternatives to be considered during the EIA Process. The CSIR is undertaking the PPP for this EIA. Details on the PPP are included in Chapter 4 of this Environmental Impact Assessment Report.

The EIA team which is involved in this Scoping and EIA Process is listed in **Error! Reference source not found.** below. This team includes a number of specialists which have either been involved to date, or are planned to provide inputs during the EIA Process.

Table 1.5: The EIA Team

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Environmental Management Services (CSIR)		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Surina Laurie	CSIR	Project Leader (*Pr. Sci. Nat.)*
Kelly Stroebel	CSIR	Project Manager (Appointed EAP)
Babalwa Mqokeli	CSIR	Project Officer
Specialists		
Simon Bundy	Sustainable Development Projects (SDP)	Ecological Impact Assessment (including Terrestrial Ecology)
Jon Smallie	Wild Skies Ecological Services	Avifauna Impact Assessment
Luanita Snyman-Van der Walt	CSIR	Visual Impact Assessment
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
Dr. John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
Christo Bredenhann	WSP	Review of the Traffic Impact Statement complied by CSIR using existing information.
Rudolph du Toit	N/A	Review of the Social Impact Statement complied by CSIR using existing information.
Johann Lanz	N/A	Review of the Soils and Agricultural Potential Impact Statement complied by CSIR using existing information.

Due to the proximity of the proposed project to identical projects, existing information has been used to provide impact statements for soils and agricultural potential, social issues and traffic impact. These impact statements have been included in this Draft Environmental Impact Assessment Report (DEIAR) and have been reviewed by qualified specialists in the respective fields. Please see Appendix N for the inclusion of these statements.

juwi has appointed the services of an Square Kilometre Array (SKA) approved specialist to conduct RFI and Electromagnetic Interference (EMI) based studies to determine the level of mitigation shielding required in order to comply with the SKA Regulations. Please refer to Chapter 7 for the ToR's for the RFI study. The findings of this assessment have been provided to the SKA for consideration and comment. The comments received from SKA have been included in Appendix O.

1.7. Details and Expertise of the Environmental Assessment Practitioner

Kelly Stroebel is a Junior EAP in the EMS group of the CSIR and holds an Honours degree in Environmental Science. She has been the Project Manager of several EIAs in South Africa and several Basic Assessments for the Special Needs and Skills Development Programme. She has also assisted in the SIP projects including the National Wind & Solar Strategic Environmental Assessment (SEA) and Electricity Grid Infrastructure SEA which were commissioned by the national Department of Environmental Affairs.
Kelly will be supported by the EIA Project Team as outlined within **Error! Reference source not found.**.

1.8. Objectives for this EIA Report

This EIA Report was preceded by a comprehensive Scoping Process. During the Scoping Phase, the Scoping Reports were made available to Interested and Affected Parties (I&APs) and stakeholders for a 30-day comment period extending from 20 September 2017 to 23 October 2017. The comments received from stakeholders during the 30-day review of the Scoping Report were incorporated into the Scoping Report (where required), and the finalised Scoping Report was submitted to the DEA on the 3rd of November 2017, in accordance with Regulation 21 (1) of the 2014 NEMA EIA Regulations, as amended, for decision-making in terms of Regulation 22 of the 2014 NEMA EIA Regulations. It is important to note that (for the purpose of completeness and continuity), the comments received from I&APs during the Scoping Phase have been included in Appendix G of this EIA Report. The DEA accepted the finalised Scoping Report and Plan of Study for EIA on 30 November 2017, which marked the end of the Scoping Phase (Appendix O this EIA Report), after which the EIA Process moved into the impact assessment and reporting phase. For background on the Scoping Process, the reader is referred to the Scoping Report (CSIR, 2017).

This EIA Report is currently being released to stakeholders for a 30-day review period. All comments received will be included in the finalised EIA Report, which will be submitted to DEA for decision-making.

The primary objective of this EIA Report is to present stakeholders, I&APs and the Competent Authority, the DEA, with an overview of the predicted impacts and associated management actions required to avoid or mitigate the negative impacts; or to enhance the benefits of the proposed project.

In broad terms, the amended 2014 NEMA EIA Regulations (GN R326) stipulates that the EIA Process must be undertaken in line with the approved Plan of Study for the EIA, and that it must include a description of the potential environmental impacts, mitigation and closure outcomes, as well as the residual risks of the proposed activity.

Based on the 2014 NEMA EIA Regulations, the objectives of the EIA Process is to:

- determine the policy and legislative context within which the activity is located and note how the proposed activity complies with and responds to the policy and legislative context;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- determine the nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and the degree to which these impacts (a) can be reversed; (b) may cause irreplaceable loss of resources, and (c) can be avoided, managed or mitigated;

- identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- identify suitable measures to avoid, manage or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

In terms of legal requirements, a crucial objective of the EIA Report is to satisfy the requirements of Appendix 3 of the amended 2014 NEMA EIA Regulations (as noted in Regulation 23 (3) of the GN R326). This section regulates and prescribes the content of the EIA Report and specifies the type of supporting information that must accompany the submission of the EIA Report to the Competent Authority. An overview of where the requirements of Appendix 3 of the 2014 NEMA EIA Regulations are addressed in this EIA Report is presented in **Error! Reference source not found.**.

As noted in Regulation 23 (4) of the GN R326, the EMPr that is required as part of the EIA Process is provided in Part B of this EIA Report and has been structured to comply with the requirements outlined in Appendix 4 of the 2014 NEMA EIA Regulations, as well as the requirements of DEA's acceptance of the Scoping Report and Plan of Study for EIA (as shown in Appendix O of this EIA Report). An overview of this compliance is shown in Part B of this EIA Report. In addition, the specialist studies that have been conducted as part of the EIA Phase need to comply with Appendix 6 of the amended 2014 NEMA EIA Regulations. Each specialist study (Appendix I to Appendix N) provides an overview table showing compliance with the regulations.

Furthermore, this process is designed to satisfy the requirements of Regulations 41, 42, 43 and 44 of the amended 2014 NEMA EIA Regulations relating to the PPP and, specifically, the registration of and submissions from I&APs.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 2:

Project Description

CONTENTS

TABLES

FIGURES

CHAPTER 2. PROJECT DESCRIPTION

This chapter provides an overview of the conceptual project design and an overview of the site and technology selection process for the Skeerhok PV 2 Solar Energy Facility (SEF), referred to as Skeerhok PV 2, as provided by juwi.

The purpose of this chapter is to present sufficient project information on the proposed Solar PV facility (including the facility itself and the associated infrastructure) to inform the EIA Process in terms of design parameters applicable to the project.

As noted previously, the proposed project will take place on Portion 9 of Gemsbok Bult Farm 120 (Surveyor General 21-Digit Code: C03600000000012000009) near Kenhardt in the Northern Cape. The co-ordinates of the boundary/corner points of the preferred project site (Skeerhok PV 2) are shown in Table 2.1 and Figure 2.1 below.

Table 2.1: Co-ordinates of the Corner Points of the Preferred Project Site

Site	Point	Latitude	Longitude
Skeerhok PV 2	A	29° 3'31.57"S	21°22'51.46"E
	B	29° 4'21.67"S	21°21'54.25"E
	C	29° 5'16.88"S	21°22'25.48"E
	D	29° 3'22.74"S	21°24'18.27"

2.1. Key Components of the Proposed Solar Energy Facility

A summary of the key components of the proposed project is described below. It is 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).

The project is being developed with a maximum possible installed capacity of 114 MWdc which produces 100 MWac of electricity. As mentioned in Chapter 1 of this EIA Report, once commercial operation date is achieved, the proposed facility will generate electricity for a minimum period of 20 years. The property on which the SEF is to be constructed will be leased by the project owner from the property owners for the life span of the project. The assessed area includes approximately 400 ha of land in total. Due to the fact that the solar PV facility requires approximately 300 ha of land, there is spatial scope to avoid major environmental constraints through optimisation of the final design of the solar facility. **Error! Reference source not found.** indicates a layout of these project areas in relation to Skeerhok PV 2.

The larger 400 ha buildable area was considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities can be avoided in the final siting and location of the proposed facility. Based on the findings of the specialist studies, an environmental sensitivity map has been produced (and included in Chapter 7 of this EIA Report). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 400 ha site that was assessed. Based on this map, the preferred location for the 300 ha Skeerhok PV 2 facility, also known as the Development Envelope, avoids (where possible) the sensitive features that were identified by the specialists within the original 400 ha assessed area. Based on the boundaries of the Development Envelope and the constraints of the environmental sensitivities, a site layout has also been preliminarily determined for this project (as discussed in Chapter 7 of this EIA Report).

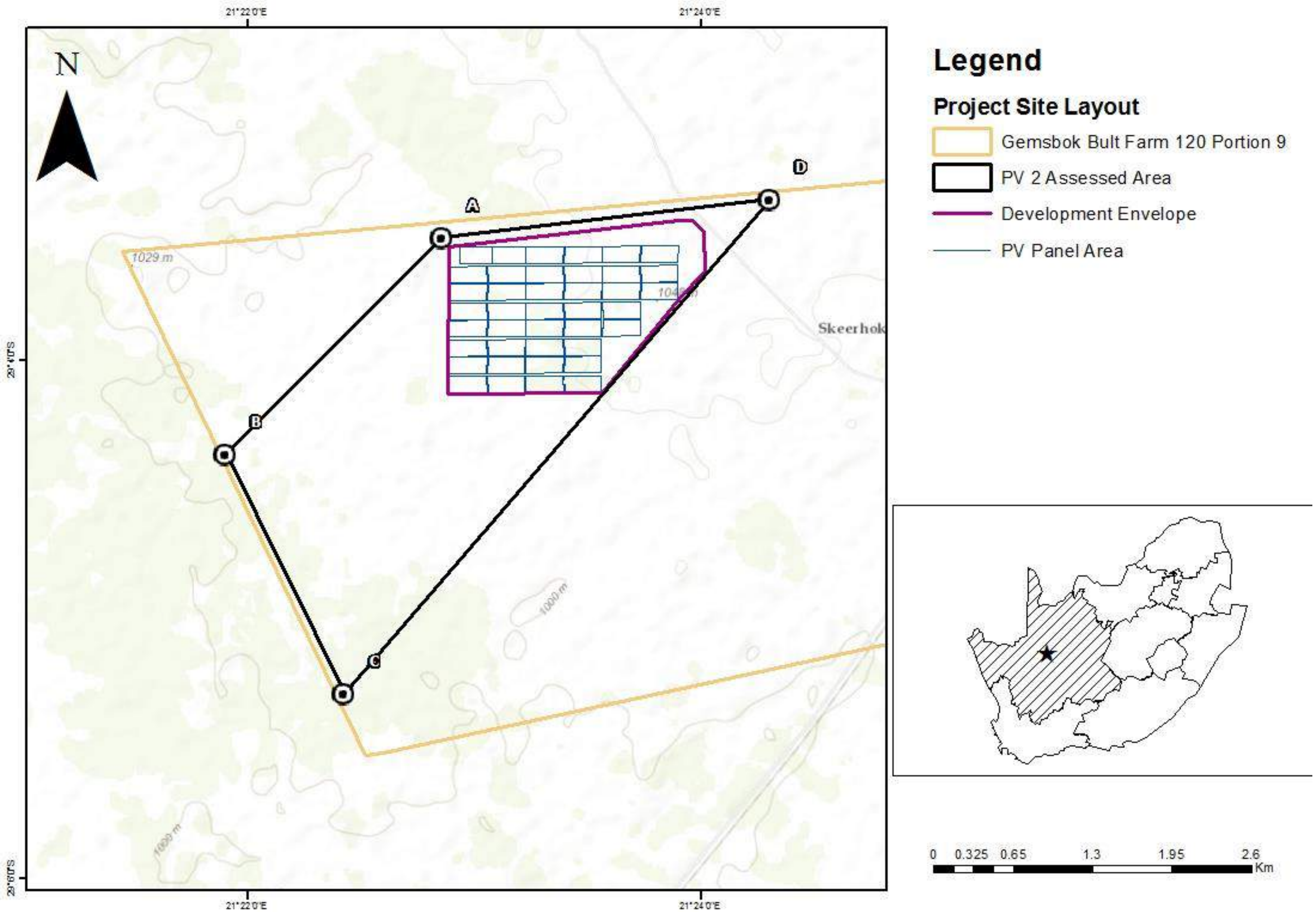

Figure 2.1: **Project Areas including corner co-ordinates of the proposed Skeerhok PV 2 (please refer to table 2.1 for the co-ordinates of points A-D)**

It should be noted that even though a site layout has been provided (as shown in Figure 2.2), should the layout change following the issuing of the EA (should it be granted), that any alternative layout occurring within the boundaries of the Development Envelope would *not* change the scope of work or the *findings* of the impact assessments undertaken during this EIA. The Development Envelope is considered to be a "box" in which the proposed project components discussed within this chapter can be constructed at whichever location (**within the boundaries of the assessed Development Envelope)** without requiring an additional assessment or change in impact significance. Any changes to the layout are therefore considered to be non-substantive. This is discussed further in Chapter 7 of this EIA Report. It should be noted that a similar approach has been followed for the electrical infrastructure and transmission lines, which has been assessed as part of a separate Basic Assessment Processes. To this end, an electrical infrastructure corridor has been proposed for proposed transmission lines.

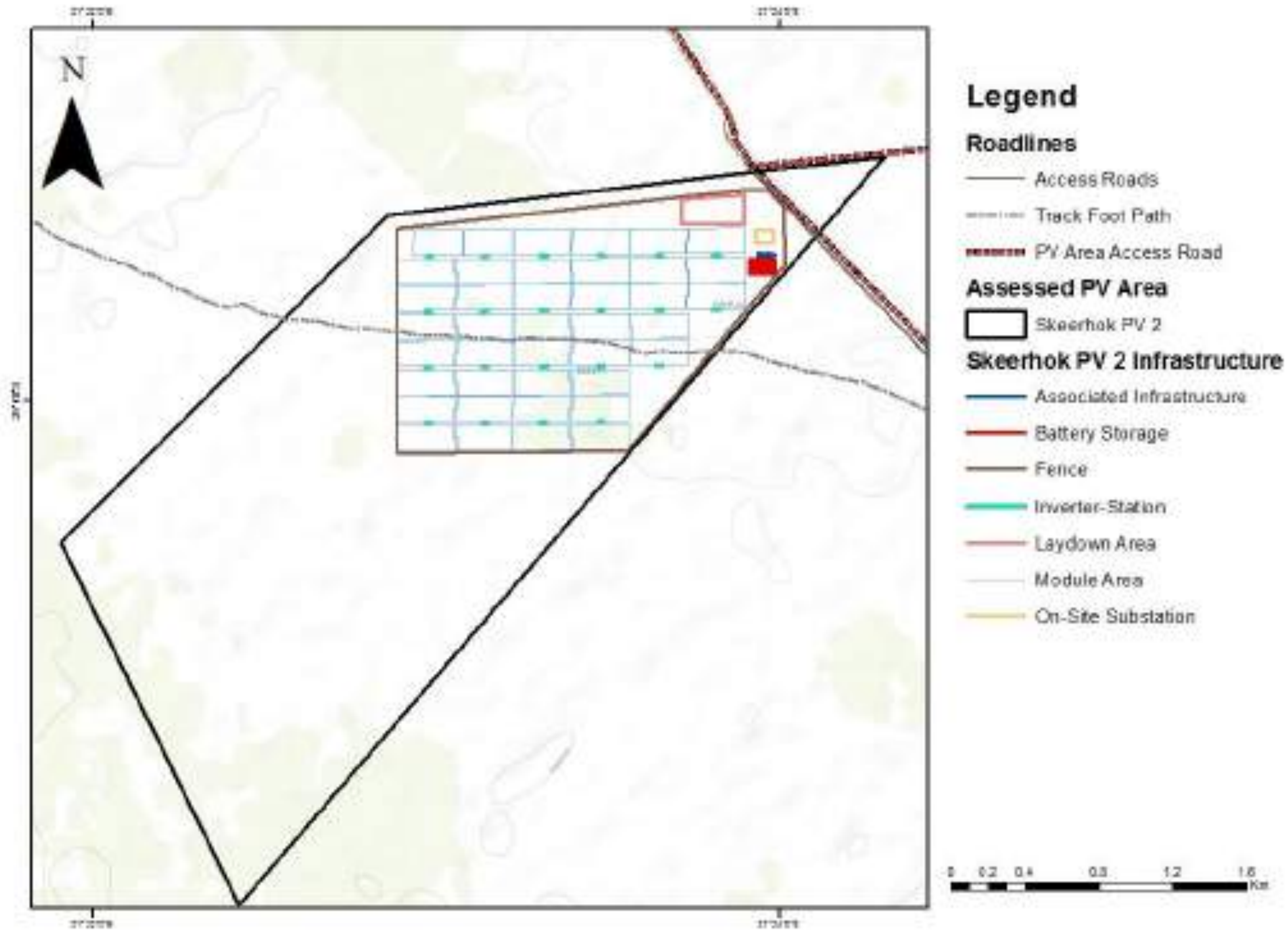

Figure 2.2: Proposed Site Layout of the Skeerhok PV 2 Facility

The total area of Portion 9 of Gemsbok Bult Farm 120395, where the proposed SEF will be constructed, is approximately 2,000 ha, while the development area (area under consideration for this assessment) of the SEF is approximately 300 ha, accounting for 15 % of the total area of the farm.

The two main components of the project will consist of the solar field (solar panels and building infrastructure) and the associated infrastructure. The technical components forming part of the Solar Facility are discussed in detail in Sections 2.2 and 2.3 below.

Table 2.2: Summary of technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	Approximately 5 m high
Area of PV Array	≤250 hectares
Number of inverters required	To be determined at detailed design phase based on the invertor sizes available at the time of construction.
Area occupied by inverter/ transformer stations/ substations	To be determined at detailed design phase based on the sizes of the invertor and transformer stations available at the time of construction. This area is however incorporated into the PV array area of ≤250 hectares as indicated above.
Capacity of on-site substation	22/33 kV to 132 kV
Area occupied by both permanent and construction laydown areas	≤1 ha permanent and ≤10 ha temporary is
Area occupied by buildings	≤1 ha area for site office, and Operations and Maintenance (O&M) buildings.
Length of internal roads	≤ 15 km
Width of internal roads	≤ 8 m
Proximity to grid connection	Approximately 30 km
Height of fencing	3 m high
Type of fencing	To be determined at construction phase based on the outcomes of the EPC procurement process.

The 100MWac Solar Facility on Portion 9 of Gemsbok Bult Farm 120 will consist of the following components:

- ***Solar Field:***
  - ≤250 ha of photovoltaic (PV) modules mounted on free field single-axis trackers or fixed tilt PV solar module mounting structures comprised of galvanised steel and aluminium; and
  - below ground electrical cables connecting the PV arrays to the inverter stations, O&M building and collector substation; and
  - Ring main units; and
  - Inverters and mini-subs.

- ***Collector substation:***
  - ≤1 ha 22/33 kV to 132 kV collector substation to receive, convert and step up electricity from the PV facility to the 132 kV grid suitable supply. The facility will house control rooms and grid

control yards for both Eskom and the Independent Power Producer. A 32 m telecommunications tower (lattice or monopole type) will be established in the substation area;

- ***O&M area:***
  - Operations and Maintenance (O&M) buildings;
  - ≤1 ha O&M laydown area (near / adjacent substation);
  - ≤0.01 ha solar measuring station;
  - Parking, reception area, offices, guest accommodations and ablution facilities for operational staff, security and visitors;
  - Workshops, storage areas for materials and spare parts;
  - Water storage tanks or lined ponds (~160 kl/day during first 3 months; ~90 kl/day for 21 months during rest of construction period; ~20 kl/day during operation);
  - Septic tanks and sewer lines to service ablution facilities; and
  - Central Waste collection and storage area.

- ***Battery Storage System:***
  - 100 MWh Battery Storage Facility with a maximum height of 8m and associated operational, safety and control infrastructure;

- ***Access road:***
  - ≤ 15 km long, ≤ 8 m wide gravel access road running from the Transnet Service Road to the site

- ***Service roads:***
  - ≤10 km of ≤ 8 m wide gravel internal service roads within the plant boundary;

- ***Other infrastructure:***
  - Perimeter fencing and internal security fencing and gates as required.
  - Access control gate and guard house on access road;
  - ≤3.5 km length of water supply pipeline connecting existing boreholes to storage, alternatively water will supplied by the local municipality.
  - Stormwater drainage

- ***Construction site office area (used during construction and rehabilitated thereafter):***
  - ≤1 ha site office area;
  - ≤ 10 ha laydown area; and
  - ≤1 ha concrete batching plant

The Skeerhok PV 2 project will connect to the Eskom Nieuwehoop Substation located on Portion 3 of Gemsbok Bult Farm 120 via a 132 kV overhead transmission line (the development of the 132 kV line will be considered under a separate Basic Assessment process).

2.2. Solar Field

The Solar Field will consist of the solar arrays and building infrastructure.

- ***Solar Arrays***

The footprint of the proposed SEF is estimated to be approximately 300 ha and will include the development of the solar field including electrical infrastructure, the structure of the solar array and foundations. The exact number of solar panel 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 Chapter 7 and Appendix O of this EIA Report. The PV array is estimated to cover less than 250ha.

- ***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 2.3).

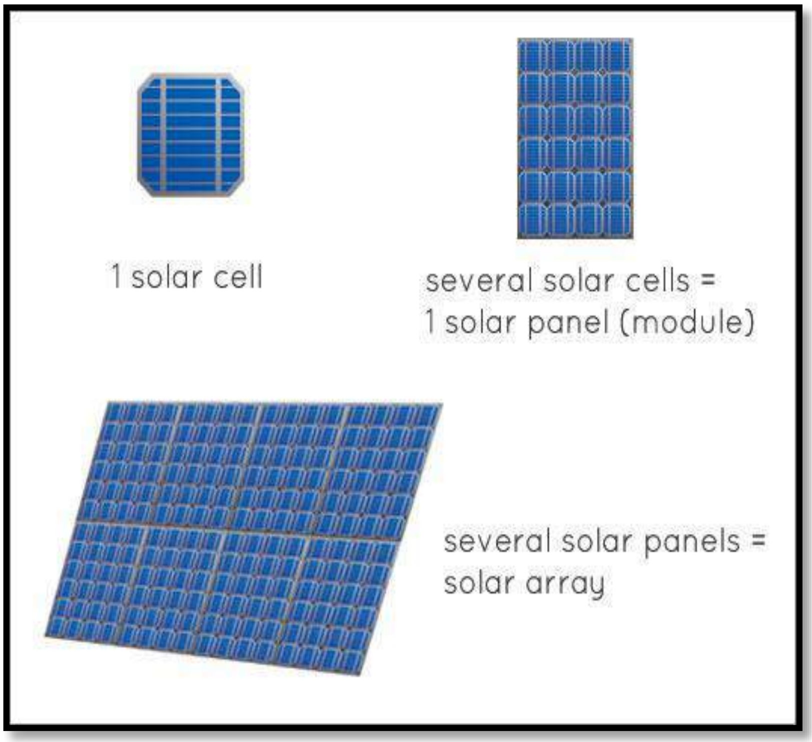

Figure 2.3: Components of the Proposed PV Installation (Source: Go Greena, 2013)

Modules are arranged into strings that form the solar field. Modules are arranged in sections called tables and are installed on racks which are made of aluminium or galvanised steel. The arrays and racks will be mounted above the ground through either steel or concrete towers (which will be confirmed during the detailed engineering phase), as shown in Figure 2.4. The entire structure is expected to be approximately 5 m in height (measured from the ground).

All the arrays will be wired to inverter stations that convert the DC power into AC power.

Figure 2.4: PV Technology

In terms of the composition of PV panels, the glass used to manufacture solar PV technology is designed to maximise absorption of light and minimise reflection, glint and glare (Spaven Consulting, 2011; BRE, 2013). No known adverse effects associated with the possible reflection and glare from solar PV panels on livestock have been flagged in solar PV planning research.

Mounting System
Solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. The three main mounting systems considered as part of the EIA are:

- Single axis tracking systems;
- Dual axis tracking systems; and
- Fixed tilt mounting structures.

In a fixed tilt mounting structure, the PV panels are installed at a set tilt facing north and cannot move, whereas in a single axis tracking system the panels follow the sun (i.e. east to west) to ensure increased exposure to sunlight, this functionality comes at a higher monetary cost to that of fixed tilt. In a dual axis tracking system, the PV panels can follow the sun from east to west, as well as follow the suns altitude (which results in an optimal angle of radiation onto the panel (Vermaak, 2014)). Dual axis tracking systems can therefore follow the sun throughout the day both horizontally and vertically, however this functionality comes at even higher monetary cost. The type of mounting system will be confirmed during the detailed engineering phase.

- ***Building Infrastructure***

The solar field will require on-site buildings, including operations and maintenance on-site substation and substation building, laydown areas and security enclosures. The on-site substation is expected to extend approximately 32 m in height, with a maximum footprint of 100 m x 100 m (≤1 ha). Ablution facilities are likely to be incorporated into the office structures occupying an area of roughly 30 m x 30 m. The buildings will likely be of single storey design. The buildings are required to support the functioning of the facility and to provide services to personnel that will operate and maintain the facility. The building infrastructure for both technology types will be the same. Detailed design will follow as the development progresses.

2.3. Associated Infrastructure

▪ ***Electrical Infrastructure***

As mentioned above, the solar arrays are typically connected to each other in strings, which are in turn connected to inverters that convert DC current to AC current. The strings will be connected to the inverter stations by low voltage underground (internal) DC cables. Power from the inverter stations will be transformed from low to medium voltage (22/33kV) at the medium voltage transformers. From here the energy passes to the ring main units which are connected in series to the proposed on-site substation, via medium voltage underground cables (22/33 kV). The voltage is again stepped up to 132kV at the onsite sub and the power produced transmitted via a 132 kV overhead transmission line into the national grid system at the Eskom Nieuwehoop substation on Portion 3 of Gemsbok Bult Farm 120. An overhead 132 kV transmission line will be constructed for the SEF and will extend between the proposed on-site substation and the Eskom Nieuwehoop Substation. It will be constructed with steel or concrete tower structures. The length of the proposed overhead line, connecting the on-site substation to the Nieuwehoop Substation is approximately 27 km.

It is quite possible that the project owner will implement the Self-Build Option for the additional electrical infrastructure to be constructed (which includes the 132 kV transmission line and additional feeder bay(s), busbar(s), 400/132 kV transformer and a transformer bay at the Eskom Nieuwehoop Substation). Following the construction phase, the proposed electrical infrastructure will either be transferred into the ownership of Eskom or remain in the ownership of the proponent.
Please note that the construction of the 132 kV transmission line, service road below transmission line, the feeder bays, busbars, 400/132 kV transformer and transformer bay at the Eskom Substation will be subject to a separate BA process and will not be considered as part of this EIA process.

Detailed design will follow as the development progresses.

▪ ***Roads***

The main access road will be the National Road, the R27, and an existing Transnet Service Road leading to the site. The R27 extends from Keimoes, which is the most northern point of the road, 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 is 7-8 m wide. It is proposed that an internal gravel access road be constructed from this Transnet Service Road to the proposed site. This road is not expected to be more than 8 m wide. The length of the internal roads will be confirmed as the location, design and layout of the facility progresses. Discussions have been initiated and held with Transnet and the Project Applicant during the Scoping and EIA Process regarding the potential use of the Transnet Road and any specific associated requirements.

In terms of traffic generation, a Traffic Impact Statement has been included in Appendix N of this EIA Report.

The types of materials that will need to be transported to site during the construction phase include the following:

- Transformers;
- PV Modules;
- Converter components;
- Steel and Aluminium for Racking;

- Switchgear and equipment;
- Cables;
- Gravel and sand;
- Concrete;
- Water;
- Reinforcement; and
- Other material.

During the operational phase, far 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. A description of the vehicle trips are provided in Appendix N of this EIA Report.

- ***Fencing***

For various reasons (such as security, public protection and lawful requirements), the proposed facility will be secured via the installation of boundary fencing. The fencing is planned to be approximately 3 m high. Access points will be managed and monitored by an appointed security service provider. The type of fencing is yet to be determined; however it may be a fully electrified option. Detailed design will follow as the development progresses.

- ***Panel Maintenance and Cleaning***

The accumulation of dust on solar panels negatively influences the productivity of the solar facility, as such the panels generally require regular cleaning. Cleaning and maintenance of the panels will require water. It is proposed that panel cleaning will take place quarterly; however this may be revised should the site conditions warrant more frequent cleaning. Should municipal water be delivered to site it will be stored on site in suitable containers during the operational phase. It is estimated that 7000 kilolitres of water will be used annually for the cleaning of the solar panels, road maintenance and general employee usage during the operational phase (the project has a minimum lifespan of 20 years). It is estimated that during the first 3 months of construction approximately 160 kL/day predominantly for road construction. For the remaining 21 months of construction approximately 90 kL/day.

- ***Stormwater drainage***

Although care has been taken to avoid drainage areas, if required, stormwater infrastructure will be constructed on the site to ensure that stormwater run-off from the site is appropriately managed. This run-off water will not contain any chemicals or hazardous substances, and will be released into the surrounding environment, via the stormwater infrastructure, at suitably selected natural drainage points.

- ***Battery storage facility***

It is proposed that a nominal 100 MWh Battery Storage Facility for grid storage would be housed in containers, or enclosed within a building, with a maximum height of 8m and associated operational, safety and control infrastructure. Three types of battery technologies are being considered for the proposed project: Lithium-ion, Sodium-sulphur or Vanadium Redox flow battery.

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the completely dispatchable power generation market competing directly with typically fossil fuel sources of power generation, thereby providing a truly sustainable electricity supply option.

- ***Batching plant***

A concrete batching plant is proposed as part of the Construction Site office area, with a footprint of approximately 1 ha.

2.4. Overview of Project Development Cycle

2.4.1. Construction Phase

The construction phase will take place subsequent to the issuing of a positive EA from the DEA and once a power purchase agreement (PPA) with a suitable energy off-taker is signed, this could be Government or private. The construction phase is expected to be approximately 12 - 24 months for the proposed Solar PV Facility.

The construction phase will involve the transportation of personnel, construction material and equipment to the site, and personnel away from the site (the personnel that will not be accommodated on-site). In terms of site establishment, laydown areas will be required at the outset of the construction phase, as well as dedicated access routes from the laydown areas to the working areas. Haul roads for construction traffic (for the delivery of concrete, road materials and other construction materials) will be required, as described in Section 2.3 above.

The laydown area will be located within the assessed area. It is expected that the laydown area will be temporary in nature (for the duration of the construction phase) and will include the establishment of the construction site camp (including site offices and other temporary facility for the appointed Contractors). The laydown area is expected to cover a maximum area of 10 ha, the area will thereafter be rehabilitated (i.e. returned to its pre-construction condition) at the end of the construction phase.

All efforts will be made to ensure that all construction work will be undertaken in compliance with local, provincial and national legislation, local and international best practice, as well as the Environmental Management Programme (EMPr), which will be compiled during the EIA Phase and included in the EIA Report. 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 approximately 600 direct and 1000 indirect employment opportunities are expected to be created during the construction phase. It should however be noted that employment during the construction phase will be temporary, whilst being long-term during the operational phase.

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

- Removal of trees and large bushes and ground-vegetation clearance for buildings and substations;
- Excavations for infrastructure and associated infrastructure;
- Establishment of a laydown area for equipment;
- Construction of internal access roads where required;
- Stockpiling of topsoil and cleared vegetation;
- Transportation of material and equipment to site; and
- Construction of the solar field (consisting of the solar arrays and buildings) and additional infrastructure.

2.4.2. Operational Phase

The following activities will occur during the operational phase:

- Generation of 100 MWac of electricity to add to the national grid;
- Storage of 100 MWh of energy; and
- Maintenance of the SEF, including washing of panels (as explained in Section 2.3).

The projected operations are expected to provide several services and added economic spin offs (as highlighted in Chapter 1 of this EIA Report). The proposed SEF is expected to generate electricity for a minimum period of between 10 and 20 years. The operational phase of the project is expected to create skilled employment opportunities. However, other opportunities may arise for unskilled labour to be integrated to the ancillary activities. During the operational phase, approximately 50 direct and 150 indirect opportunities will be created over the 20 year lifespan of the proposed facility.

2.4.3. 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 SEF becomes outdated or the land needs to be used for other purposes), the decommissioning procedures will be undertaken in line with the EMPr and any legislation or guidelines relevant at the time and the site will be rehabilitated and returned to the pre-construction state.

If the site is not decommissioned, it is possible that a lease extension could be granted based on agreements with the landowner, as well as a renewed PPA. If this occurs, the site and technologies could possibly be advanced and upgraded, subject to the legislative requirements at that point in time.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 3:

Description of the Affected Environment

CONTENTS

TABLES

FIGURES

CHAPTER 3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter of the EIA Report provides an overview of the affected environment for the proposed Skeerhok PV 2 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 here has been sourced from:

- Preliminary scoping input from the specialists that form part of the project team;
- Inputs from the Scoping and EIA Reports of the proposed Mulilo Renewable Project Development's Nieuwehoop Phase 1 and Phase 2 Solar PV projects proposed adjacent to the proposed Skeerhok PV 2 project (this project);
- 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 an overview and does not represent a detailed environmental study. Detailed descriptions of the proposed project site (Skeerhok PV 2) focused on significant environmental aspects of this project are provided in the relevant specialist studies (which are included in Appendix I to N of this EIA Report).

3.1. Background

The proposed project is located on Portion 0 of the Farm Smutshoek 395 near Kenhardt in the Northern Cape Province. The total farm property is approximately 2000 ha in size and the development footprint is 300 ha for Skeerhok PV 2. As previously noted, the site is located approximately 43 km north-east of Kenhardt, in the ZF Mgcawu District Municipality and the !Kheis Local Municipality in the Northern Cape Province. The co-ordinates of the corner points of the preferred project area are provided in Chapter 2 of this EIA Report. Figure 3.1 provides a locality map of the proposed project area within a regional setting.

3.2. Preliminary Sensitivity Screening

Based on the preliminary sensitivity screening undertaken for the site, 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. The proposed SEF falls within the *Bushmanland Arid Grassland* veld type (NKb3), which is an extensive habitat form, located primarily to the south of the Orange River, but may include a number of smaller habitat forms within its broader extent. This type of vegetation is classified as *Least threatened* (i.e. this vegetation type is not listed as Threatened Ecosystems under the National Environmental Biodiversity Act (NEMBA)). In terms of the National Biodiversity Assessment (NBA) (2011), rivers are classified into critically endangered,

endangered, vulnerable and least threatened. Two drainage features flow in close proximity to the farms of the proposed SEF, one of these is the *NRougas se Loop* flowing towards the Smutshoek Farm 395 and an unnamed drainage feature running towards Portion 9 of Gemsbok Bult Farm 120. These features are classified as Class B (Largely Natural) National Freshwater Ecosystems Protected Areas (NFEPA) (Figure 3.9). These features have also been identified as Ecological Support Areas in terms of the SANBI Conservation Plan for the Northern Cape.

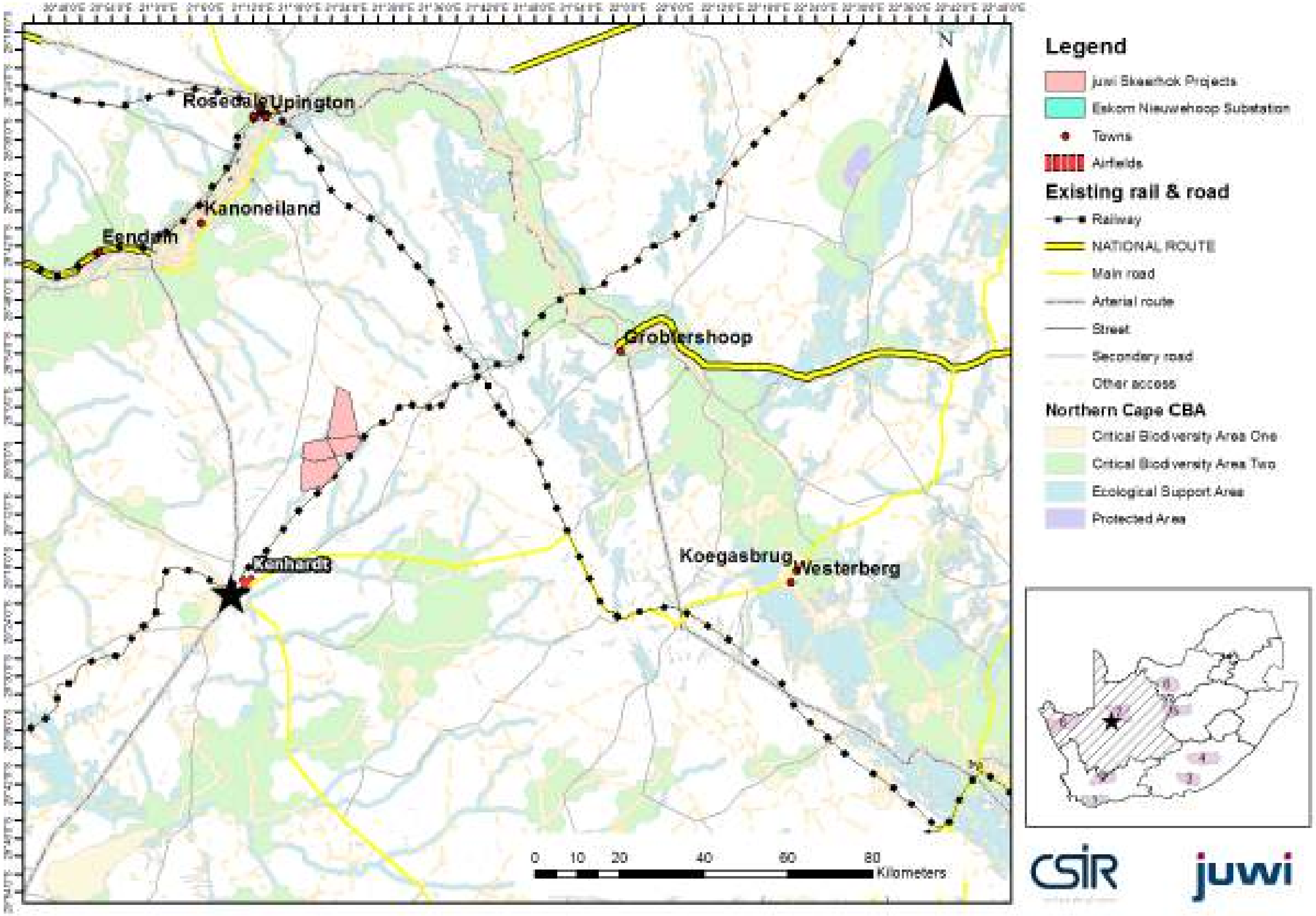

Figure 3.1: Locality Map for the proposed Skeerhok PV 2 Project within a regional setting

3.3. Biophysical Environment

3.3.1. Climatic Conditions

The mean annual rainfall of South Africa is shown in Figure 3.2 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).

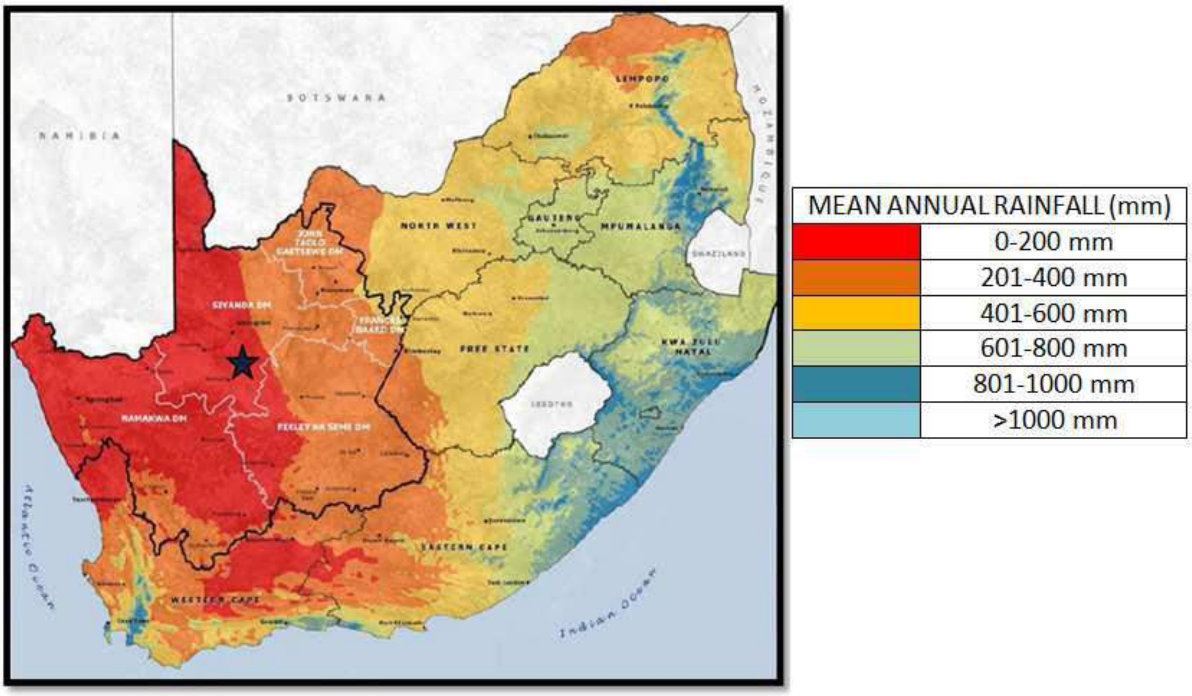

Figure 3.2: Mean Annual Rainfall Levels of South Africa (Source: Northern Cape PSDF, 2012)

Figure 3.3 shows the average rainfall and rainy days in Kenhardt for 2016, and Figure 3.4 shows the average rainfall and evaporation for Kenhardt in 2015. The lowest rainfall occurrence was in Julye (0.1 mm) and the highest rainfall occurrence was in January 2017 (59.8 mm). The area receives most of its rainfall during autumn (March to May), with a semi-arid to arid climate. The relevance of this information is that rainfall occurs whilst temperatures are still quite high and therefore the associated evaporation rates will be high. This implies that groundwater recharge will need to be assessed prior to construction.

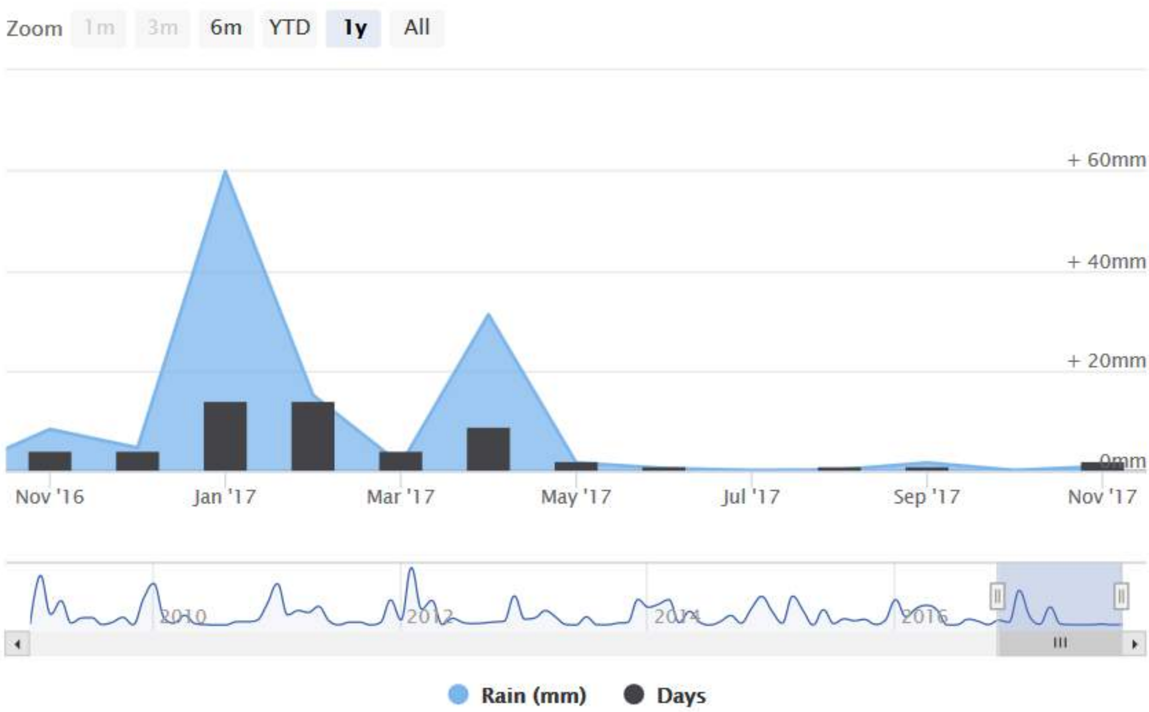

Figure 3.3: Mean Rainfall Levels and Rainy Days for Kenhardt in 2016 (Source: WeatherOnline.com)

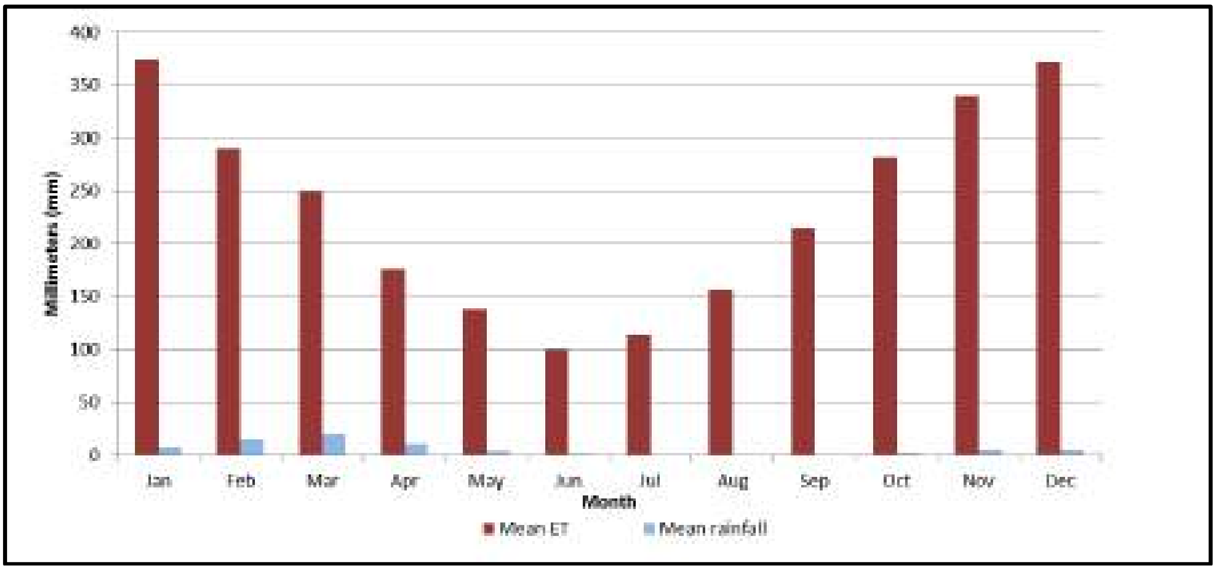

Figure 3.4: Long Term Average Rainfall and Evaporation (Schulze *et al.*, 2008 in GEOSS, 2015)

Figure 3.5 shows the average monthly climatic chart for Kenhardt[1]. As shown in Figure 3.5, 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

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

temperature of 28˚C and an annual average low temperature of 11˚C. 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 discussed in Chapter 2 and Chapter 5 of this EIA Report and shown in Figure 5.4, 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).

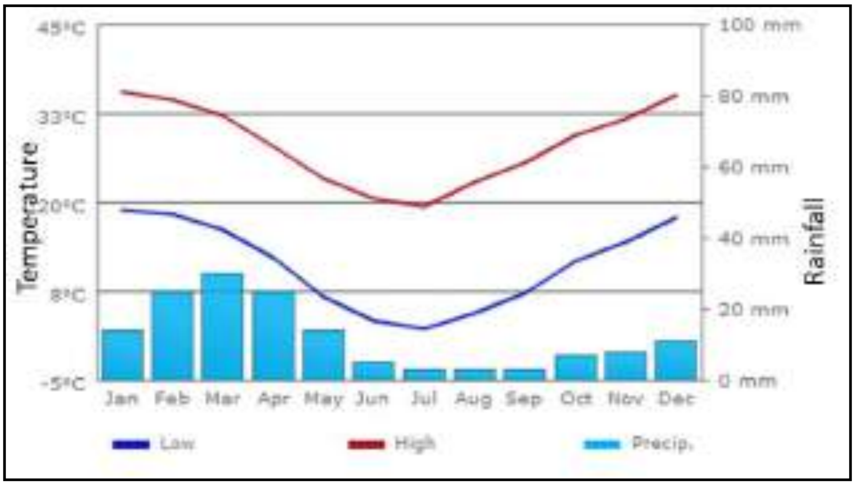

Figure 3.5: Climate chart for Kenhardt showing the monthly maximum and minimum temperatures (lines) and the average rainfall (bars) (Source: Climatedata)

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 3.1). The proposed development site falls within class 6 which is described as a very severe limitation to agriculture (Lanz, 2015).

Table 3.1: 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

3.3.2. Topography and Landscape

The topography of the region is flat with gentle, open undulations (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).

The Kenhardt landscape is arid with brown sand occurring widely and 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).This was also evident during the avifaunal specialist's site visit conducted as part of the scoping phase assessment; where a Martial Eagle was spotted sitting on top of a Sociable Weaver's nest on a Telkom pole (Wildskies, 2017).

The elevation characteristics of the project area are very slight with an average of slope of 0.5 %, an elevation gain of approximately 27 m on the north-east profile (across 14 km) and 31 m on the east-west profile (across 6 km) (Figure 3.6) (Google Inc., 2015).

A description of the geology and vegetation of the region is provided in their respective sections of this chapter.

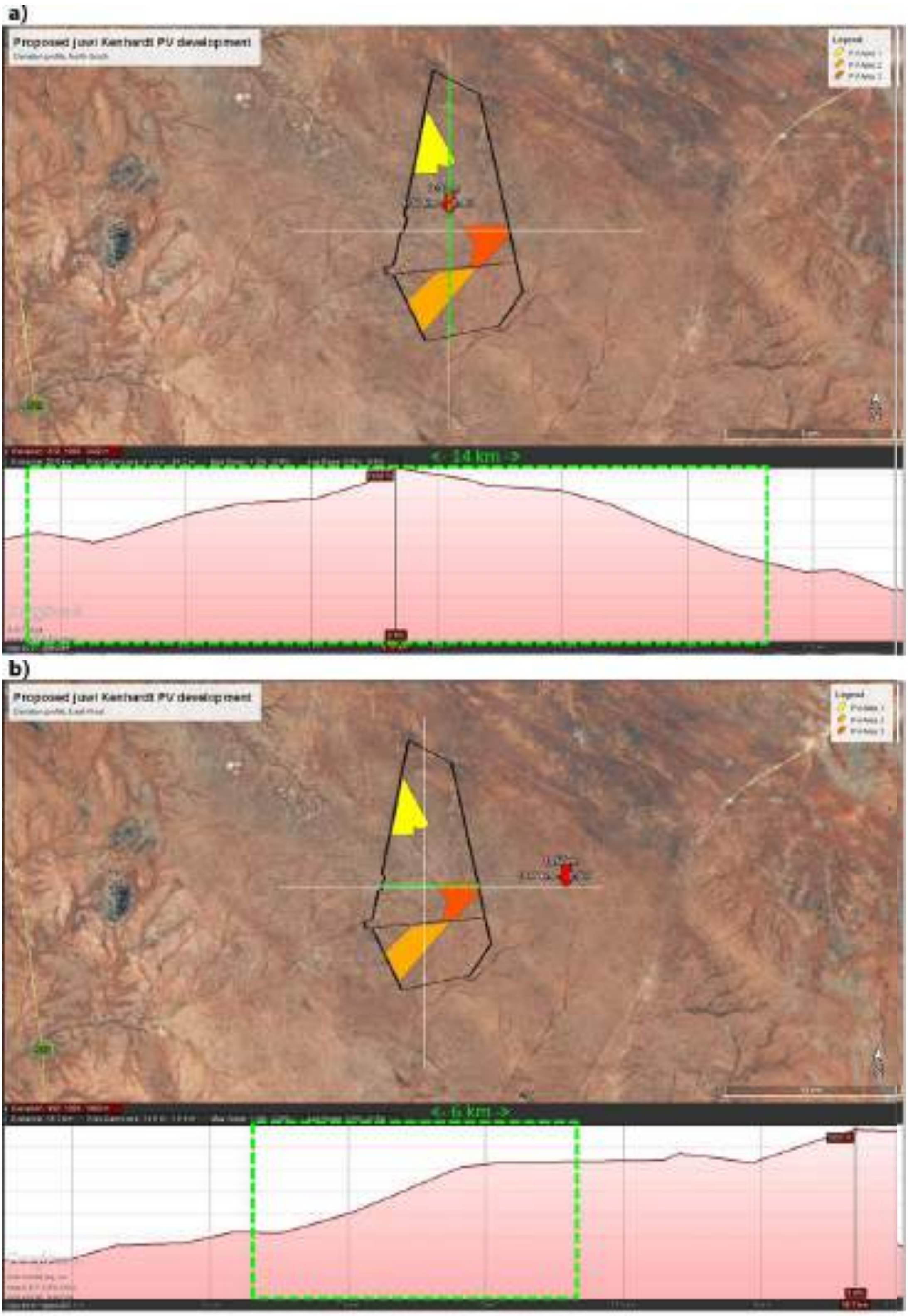

Figure 3.6: The project area is in a semi-desert steppe characterised by slight slope. The green dotted lines indicate the position of the project area in the landscape. There is an elevation gain of approximately 27 m on the north-east profile (a) and approximately 31 m on the east-west profile (b) (Google Inc., 2015).

3.3.3. 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 geological features associated with the proposed PV site, as well as that of the additional affected farm portions are shown in Figure 3.7 below. The Skeerhok PV 2 Facility is situated on Gemsbokbult Granite and Klip Koppies Granite outcrops. These formations are part of the Keimoes Group.

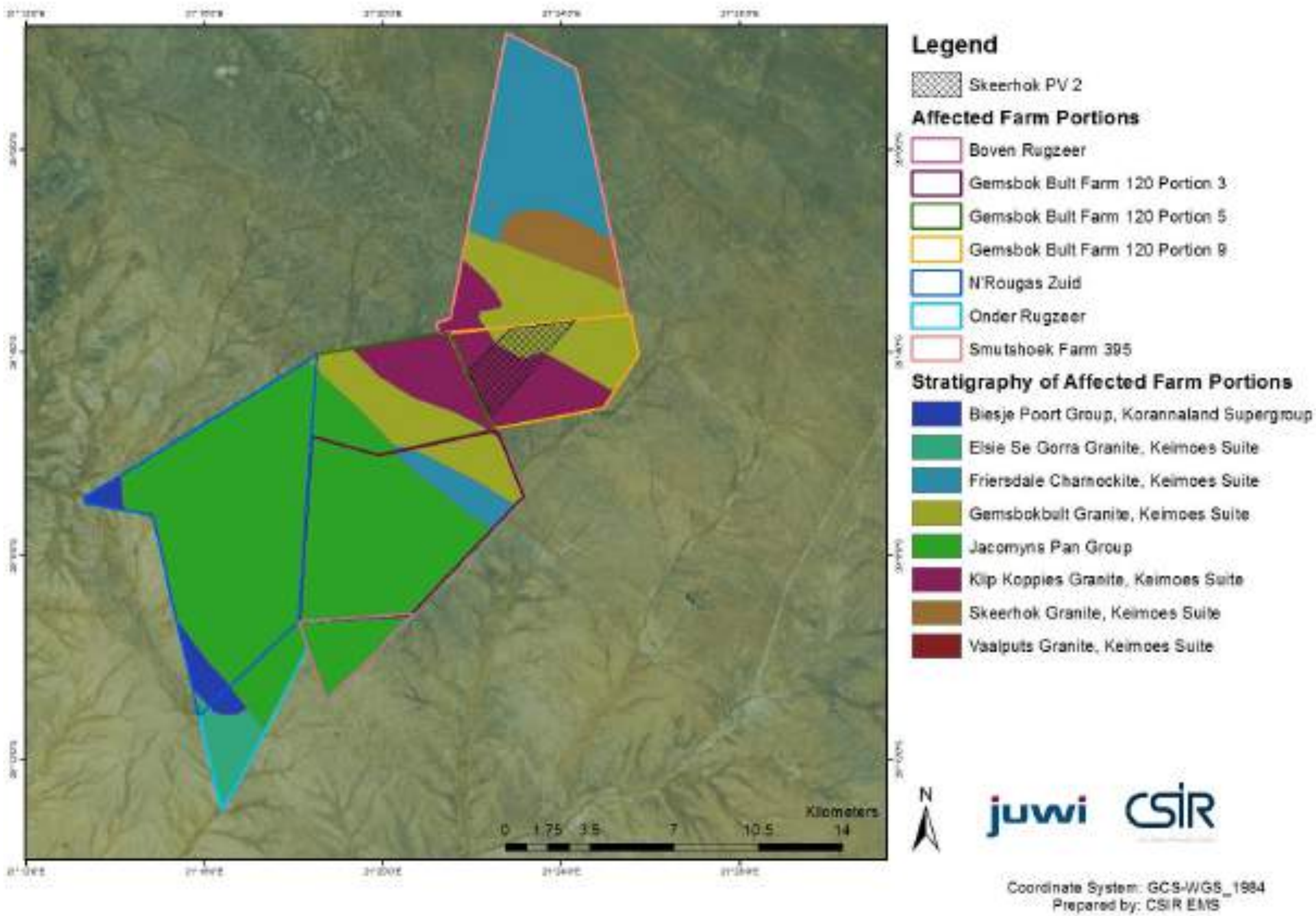

Figure 3.7: Geological setting of the PV areas, and that of the additional affected farms.

3.3.4. Soil Types and Soil Potential

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The proposed project is located across two very similar land types, Ag6 and Ag5.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 Table 3.2. 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, 2015).

Table 3.2: Land Type Soil Data for the Site

Land type	Land capability class	Soil series (forms)	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ag6	7	Hutton Mispah Hutton Hutton Rock outcrop	10-35 5-15 45->120 10-35 0	6-12 5-12 6-12 10-20	7-15 7-15 15-25	ca, so, db R ca, so, R ca, so, db R	43 14 10 9 8
Ag5	7	Hutton Mispah Mispah Hutton Hutton Rock outcrop	10-35 5-15 5-15 45->120 10-35 0	5-12 4-12 4-12 6-12 10-20	6-15 7-15 15-25	ca, so, db R ca ca, so, R ca, so, db R	43 14 12 10 9 8

Land capability classes: 7 = non-arable, low potential grazing land.
Depth limiting layers: R = hard rock; so = partially weathered bedrock; ca = hardpan carbonate; db = dorbank hardpan.

3.3.5. Agricultural Capability and Sensitivity

Land capability is the combination of soil suitability and climate factors. The area has a land capability classification, on the eight 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. The current farmer uses an average stocking rate of 10 hectares per sheep (Lanz, 2017).

3.3.6. Regional Hydrogeology

According to the 1:500 000 scale groundwater map of Prieska (2920) the entire study area hosts an intergranular and fractured aquifer (i.e. the wind-blown sands and river alluvium as well as fractures within the bedrock constitutes an aquifer) with an average borehole yield of 0.1 ℓ/s to 0.5 ℓ/s (GEOSS, 2014).

With such low rainfall in the area, and thus associated low groundwater recharge conditions, it is anticipated that the groundwater quality will be poor. The area is characterised as having low borehole yields, determined from the boreholes that are in close proximity to the proposed site. The option to make use of borehole water for the proposed Skeerhok PV 2 project will need to be verified before being ruled out as an option.

3.3.7. Ecology: Aquatic and Terrestrial Environment

The ecological evaluation is based on desktop evaluations of the site and general area, as well as on site evaluations of the study area by the Ecology Specialist. The SANBI BGIS was used to define the regional vegetation and water resources present in the area and the anticipated ecological sensitivity of the receiving environment. In addition, 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. The specialist undertook a biophysical evaluation of the land upon which the project is proposed to be established during the period June to November 2017 and entailed both a literature review of the region, as well as on site evaluations, during which specific primary data was collected and evaluated. In addition, the identification of key ecological features on and adjacent to the site was undertaken allowing for the interpretation of the prevailing habitat form and associated processes

3.3.8. Hyrdology and 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 project lies within a xeric to semi xeric environment with rainfall confined to a short period during the summer/autumn months. The prevailing climate regime indicates that rainfall is generally sparse, and together with the sandy percolative soils that prevail across the region there is limited potential for extensive wetland and riparian features.

The National Freshwater Ecosystem Priority 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 Priority Areas (FEPAs). No FEPAs are located within the study area or immediately downstream of the study area (SDP, 2015).

Figure 3.8 indicates the site in relation to drainage quaternaries within the region. The project area is seen to traverse three specific catchments, these being the D53B and D53C and to the north, the D73F. Primarily the subject site is drained to the north through a series of dendritic features that eventually feed directly in the Orange River at the Kakamas to Upington stretch of this system. A component of the site may also serve the Hartebees River (D53C) which also eventually drains into the Orange River (Figure 3.8) (SDP, 2017).

Figure 3.8: Proposed project area and relation to drainage quaternaries within the region (SDP, 2017)

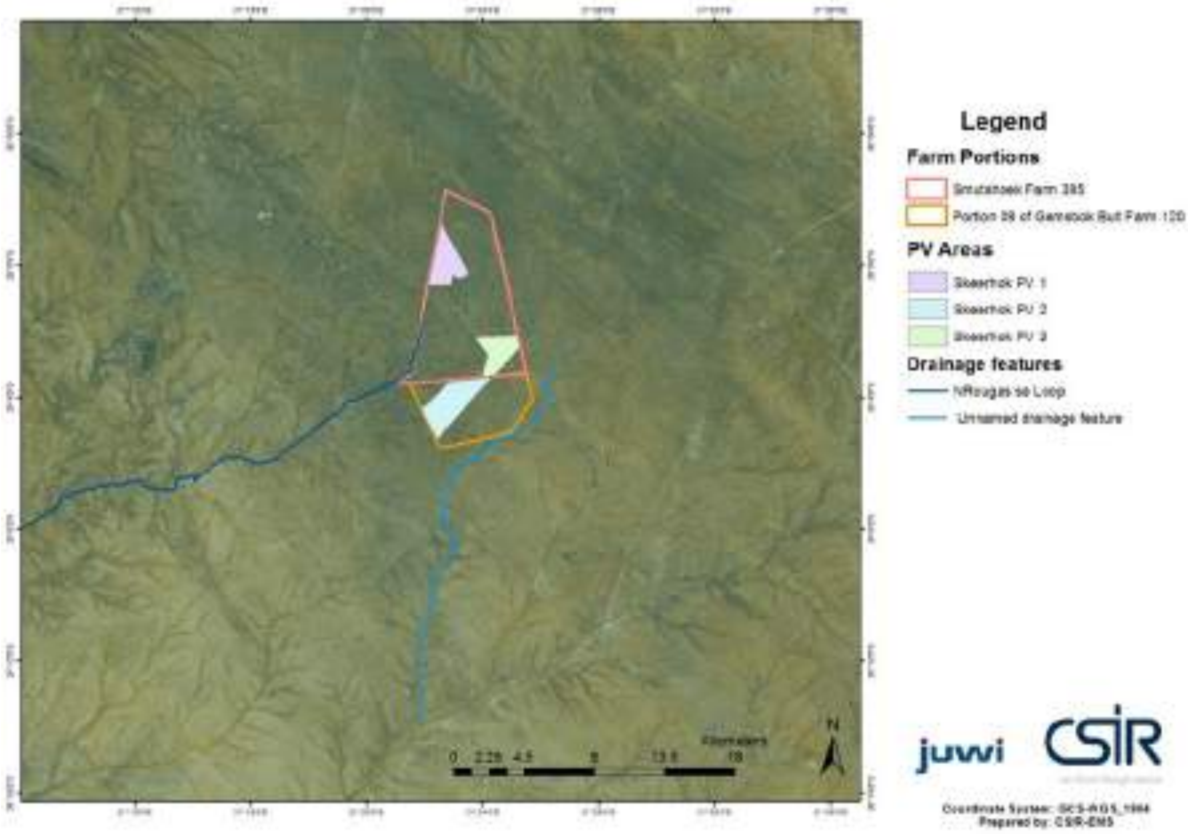

Figure 3.9: Proposed project area in relation to the major drainage features in the region.

The primary drainage features serving the proposed Skeerhok PV 2 site are the NRougas se Loop and an unnamed drainage feature (Figure 3.9), typically common hydro geomorphological features that are served by a number of small dendritic features. These drainage features are subject to intermittent flow and are indicated primarily by evidence of flow or deposition of materials (Brinson et al., 1993; USDA 2008). As such, it will be important to identify these features within the subject sites through the identification of a combination of factors, namely verdant vegetative growth and the presence of hydrogeomorphic features. Notably, there is an absence of distinct riparian and geohydromorphic soil indicators that are indicative of wetland and river habitats and it is common for extraneous factors, such as the regular passage of livestock, to drive the formation of these dendritic drainage features on sites. The absence of these indicators is due primarily to the fluctuating levels of inundation in these drainage features, over extended periods of time which is also driven by the intensity and erratic rainfall experienced in this region. Farmers in the region note that these features show short term inundation with water during high rainfall periods, in events that arise “every 4 to 5 years” (S Strauss pers. comm.) (SDP, 2017).

Although ephemeral in terms of the presence of water within these features, these drainage lines do bestow intermittent hydrological benefit to the landscape and can in some instances, be considered groundwater “recharge zones” in respect of the local sub surface hydrology. From a biotic perspective, the drainage lines do serve as seasonally important refugia and congregation points for inter alia invertebrates (e.g. Order Odonata) and vertebrates (e.g. Order Anura) (SDP, 2017).

3.4. Terrestrial Environment

3.4.1. General Vegetation Description

The proposed site is located within the Nama-Karoo biome of South Africa and as noted previously, the site falls within the Bushmanland Arid Grassland (Nkb3) (Figure 3.10) 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 veld type is an arid grassland form comprising of extensive plains dominated by sparse, intermittent pockets of *Aristida* spp and *Stipagrotis* spp (SDP, 2017).

Although a graminoid dominated region, the vegetation type is considered to contain a number of endemic species including *Larryleachia dinteri*, a small succulent, associated with rocky outcrops and the larger *Aloe dichotoma*, which is a listed protected species in terms of the Northern Cape Conservation Act.

Notably, much of the Kenhardt region has been subject to significant and extensive grazing by livestock, particularly sheep, which has and continues to alter the vegetation structure and form within the region.

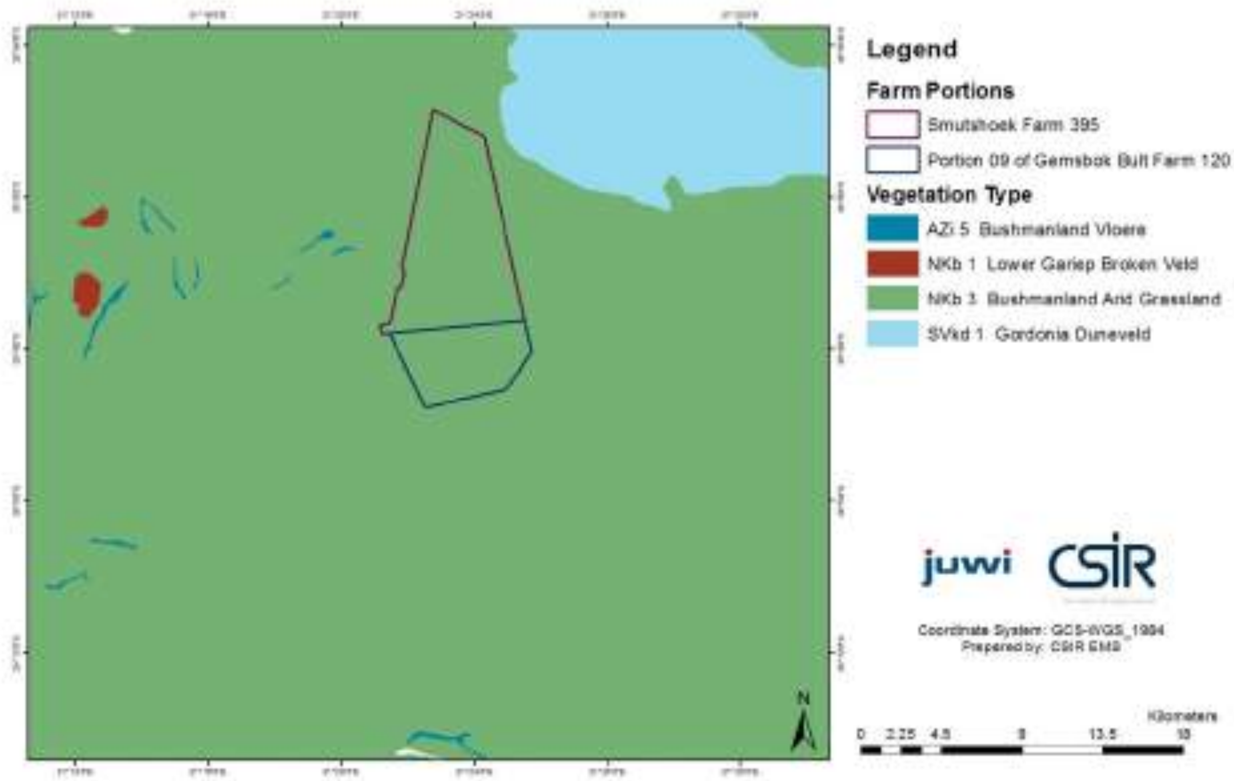

Figure 3.10: Vegetation Map in relation to the proposed project site

Fauna

Fauna that prevail within the subject region are typical of an arid environment. Due to the limited topographic variation in the terrain and the generally unvarying landscape, faunal species are widespread across the region, although the presence of key bio physical factors, including water and the presence of particular plant species may serve to concentrate species at certain localities. It follows from this that the occurrence of faunal species within the subject area is likely to be in respect of these animals either utilizing the subject area as refugia, or as part of a wider foraging range or territory. Typically, many of the mammalian and reptilian species encountered in the region are fossorial and burrowing species. Such species included meerkat (*Suricata suricata*), ground squirrel (*Xerus inauris*) and Aardvark (*Orycteropus afer*). Some larger mammals common within the region include Springbok (*Antidorcas marsupalis*) and Steenbok (*Raphicerus campestris*), which are common in the open habitat (Estes, 1992).
A number of the above species may be excluded from the PV site, once operational (in particular larger mammals and some reptiles), while smaller fossorial mammals are likely to integrate with such facilities and may indeed benefit from the presence of areas where grazing is limited and predators are excluded.

Avifauna

This arid area is home to several large terrestrial bird and raptor species, the most important of which are Ludwig's Bustard *Neotis ludwigi*i, Kori Bustard *Ardeotis kori*, Secretarybird *Sagittarius serpentarius*, Karoo Korhaan *Eupodotis vigorsii*, Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus*. In addition to being classified as threatened regionally and in some cases globally, most of these species are facing significant threats to their survival from existing impacts in the arid parts of South Africa. This area is home to an assemblage of arid zone adapted smaller bird species including larks, sparrow-larks, chats and others. Most important of these, from a conservation perspective, are Red Lark *Calendulauda burra* and Sclater's Lark *Spizocorys sclateri*, both of which are listed as regionally threatened species (Vulnerable and Near-threatened respectively), have very restricted ranges and have been recorded in the broader area within which the study area is situated. Burchell's Courser (Vulnerable) *Cursorius rufus* also occurs in the broader area (Wildskies, 2017).

It is important to note that the proposed PV site lies distally from the nearest Important Bird and Biodiversity (SDP, 2017; Wildskies, 2017).

Protected Areas
As noted in the Background Section 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.

3.4.2. Heritage Profile

In common with much of Bushmanland, the project area is a flat expanse of relatively flat terrain but with many ephemeral drainage lines visible on aerial photography. These drainages affect the various sites and their alternatives to differing degrees. Previous work in the area (Orton 2014a, 2014b, 2014c) suggests that vegetation cover is likely to be very sparse with the ground surface openly visible at all times

In terms of expected heritage resources, Bushmanland is well known for the vast expanses of gravel that occur in places and which frequently contain stone artefacts in varying densities (Beaumont, 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 are largely Early Stone Age (ESA) and Middle Stone Age (MSA) and are not associated with any other archaeological materials – 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 (ASHA Consulting, 2015).

Of potentially more significance, however, are Later Stone Age (LSA) sites which are located along the margins of water features in Bushmanland. These features include both pans and ephemeral drainage lines. Such sites have been identified in the vicinity of the present study area but generally associated with pans rather than drainages. These sites typically contain mostly stone artefacts, but fragments of ostrich eggshell (used as water containers and also as a food source) are also found at times. Similar LSA sites can also be found in association with rocky outcrops (e.g. Orton 2016c, 2016f). Because of their positions along water courses and adjacent to rocky areas, such sites are often avoided by development proposals because of the need to avoid the relevant natural features.

Despite the increased likelihood of locating archaeology along streams, Morris (2009) noted that a search along the banks of the substantial but non-perennial Hartebeest River close to Kenhardt, where he expected elevated frequencies of archaeological material, revealed virtually nothing. However, the present author has seen low density artefact scatters as well as both geometric painted and representational engraved rock art along the Hartebeest River just to the south of Kenhardt. Earlier work closer to the study area by the present author (Orton 2016c) has also revealed many important archaeological sites along one river some 13 km south of the present study area. These were a suite of LSA and historical artefact scatters with artefacts indicating occupation during the Anglo-Boer War. One painted geometric rock art site has also been found in the area, this time some 6 km south of the present study area (Orton 2016f).

Another kind of Stone Age 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. Several such occurrences of flaked quartz outcrops in particular have been noted in the general surrounding area.

The built environment is sparsely represented in Bushmanland because the farms tend to be so large. The vast majority of structures appears to be quite recent in age (20th century) and is of very limited heritage significance.

Graves are also very rare. Some older farm complexes have small graveyards located close to their farm buildings, while suspicious isolated rocks, perhaps planted upright, may mark historical graves of early mobile farmers (the so-called *trek boers*). An example has been seen some 19 km to the southwest (Orton 2016j). Unmarked pre-colonial graves can, in theory, be located anywhere, although they are generally more common in sandy areas where excavation of graves was easier and in more productive areas where population densities would have been higher.

The Anglo-Boer War was fought across the Northern Cape, but information on the role of Kenhardt appears difficult to locate. The town was occupied by the Boers on 25th February 1900 after they convinced the magistrate that they had a large gun and would fire on the town if it did not surrender. They later surrendered to the British who occupied the town on 31st March 1900. By mid-1900 there were perhaps 100 Cape Rebels detained in a camp outside of Kenhardt (Grobler 2004). The British raised a local force known as the Border Scouts in Upington in May 1900. Many were mixed-race individuals, some local farmers, others Kalahari hunters, but all disliked the Boers. The scouts were responsible for a large area of the north-western Cape Colony centred on Upington and Kenhardt. They eventually numbered 786 by January 1901 and were under the command of Major John Birbeck (AngloBoerWar.com 2015; Rodgers 2011). At the beginning of 1902 there were 150 Border Scouts stationed at Kenhardt. Two boers, H.L. Jacobs and A.C. Jooste, were accused of treason and executed in the town on 24 July 1901 (Grobler 2004). A memorial stands there to their honour (Green Kalahari n.d.).

No major action appears to have taken place around Kenhardt, although the Boers are known to have attacked a patrol on 17th May 1901, while the British attacked a Boer position on 25th June 1901 (AngloBoerWar.com 2015).

3.4.3. Cultural and Natural Landscape

The cultural landscape is very poorly developed in this area with fences, water troughs, wind pumps and occasional farm complexes being the primary features. The natural landscape largely lacks visually interesting and sensitive features, although the small quiver tree ‘forest’ located by Orton (2014b) to the southwest of the study area is regarded as a natural heritage resource (ASHA Consulting, 2017).

Archaeological resources were sparsely distributed across the study area with only a few areas found to have artefacts present in any quantity. Most were in the west, away from the development footprint (Figure 3.11). None of these was of great significance, but two areas revealed sites with some research value; only one lies inside the development footprint though (waypoint 836). There were, however, isolated background scatter artefacts found throughout the study area. A somewhat denser area of background scatter was located at waypoint 837.

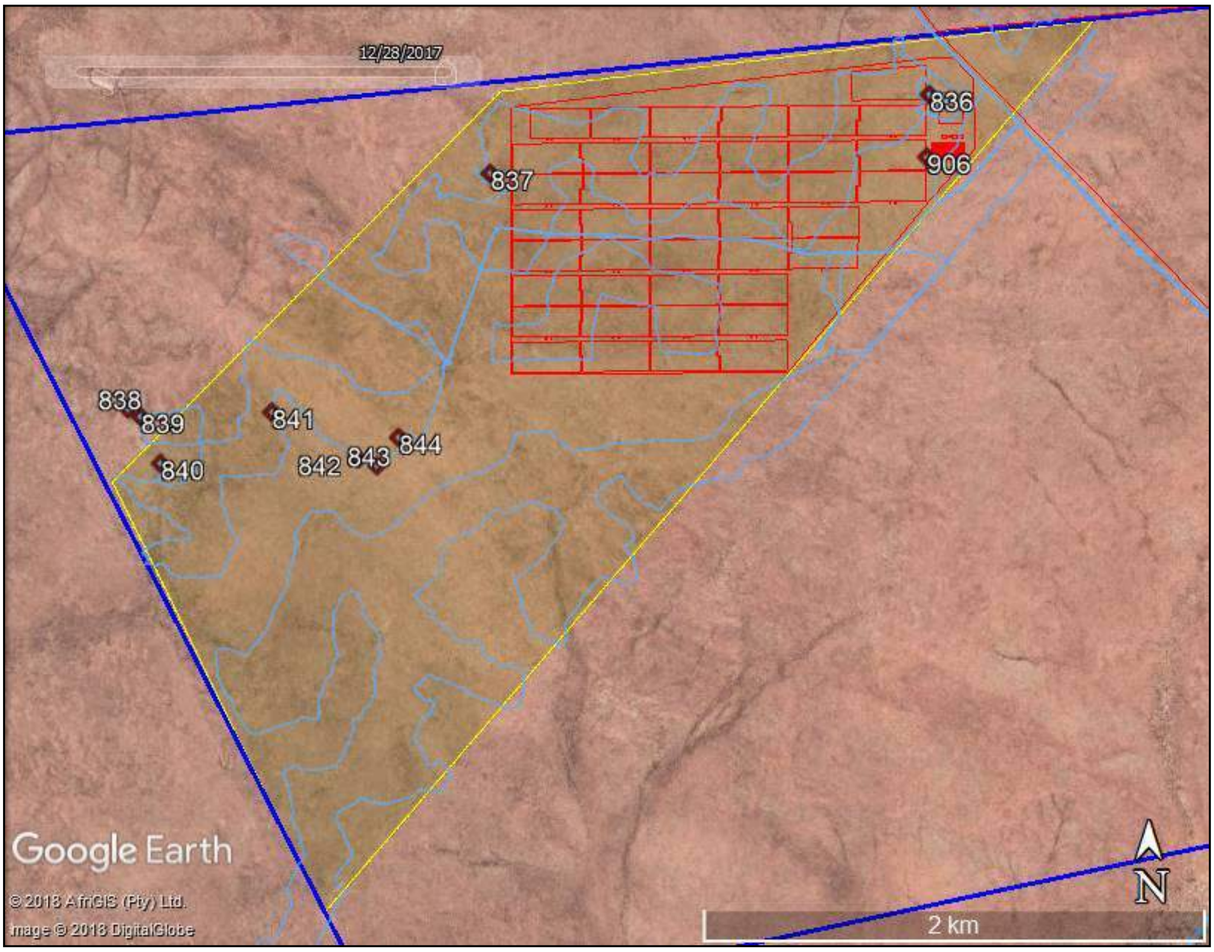

Figure 3.11: Location of findings in and around the Skeerhok PV 2 (ASHA Consulting, 2017).

3.5. Environmental Sensitivity Map

Based on the literature review of the various studies undertaken in the area, as outlined above, and the sensitivities present on site, an environmental sensitivity map has been compiled for the Skeerhok PV 2 development footprint (Figure 3.12). The sensitivities were considered during the EIA phase through various specialist studies.

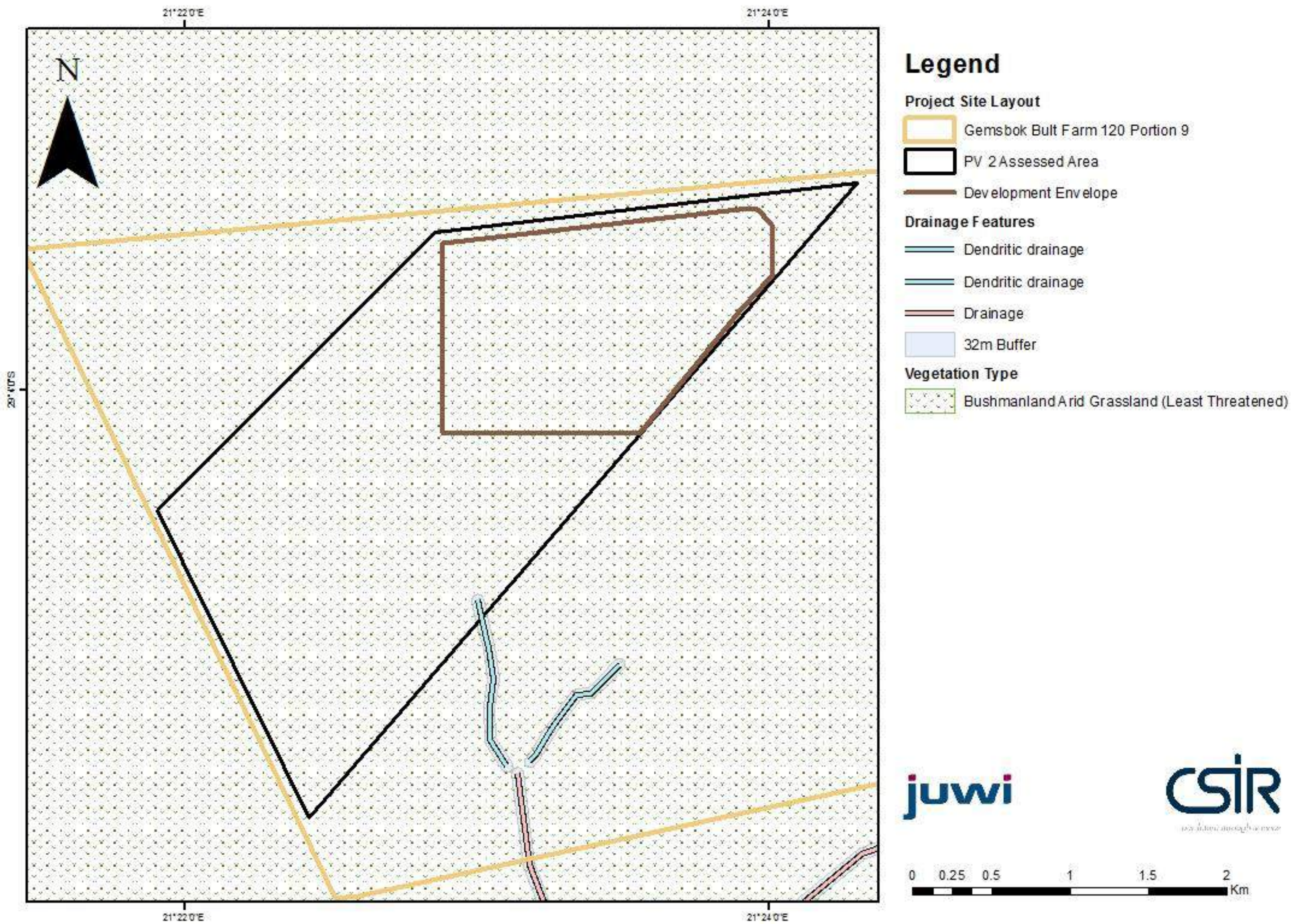

Figure 3.12: Environmental Sensitivity Map for the proposed Skeerhok PV 2 project Site

3.6. 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.

3.6.1. Demographic Profile

The ZF Mgcawu District Municipality (DM) comprises six Local Municipalities namely: Mier; Kai! Garib; Khara Hais; Tsantsabane, !Kheis and Kgatelopele and is classified as a Category C municipality (Figure 3.13). The ZF Mgcawu DM covers an area of approximately 100 000 km^2 (almost 30 % of the Province) (ZF Mgcawu DM IDP, 2014) and according to the 2011 Census has approximately 236 783 inhabitants.

The actual development footprint is located within the !Kheis Local Municipality. However, the closest urban center, Kenhardt, is located in the Kai !Garib Local Municipality.

A total of 16 703 households resides in the Kai !Garib Local Municipality, with 35 % of households being female headed. The total female population dominates the total male population by 8.5 % (Kai !Garib Draft IDP, 2014). Population of the working age demographic (i.e. 15 to 65 years) makes-up 70.5 % of the population, whereas those below 15 years of age comprise 24.4 % of the population, and the above 65 years age group makes-up 5.1 % of the population of the Kai !Garib Local Municipality. Accordingly, the dependency ratio (i.e. the economically active population vs. the non-economically active population: 24.4 % + 5.1 %) is 29.5 % (du Toit, 2015).

The !Kheis Local Municipality consists of a total of 4146 households, with 34.6 % of households being female headed. Population of the working age demographic (i.e. 15 to 65 years) makes-up 70.5 % of the population, whereas those below 15 years of age comprises 35 % of the population, and the above 65 years age group makes-up 5.1 % of the population (Statistics SA, 2015).

This data is suggestive of an area with a relatively high level of vulnerable people groups (i.e. woman and children) and, potentially, a corresponding high level of vulnerable households.

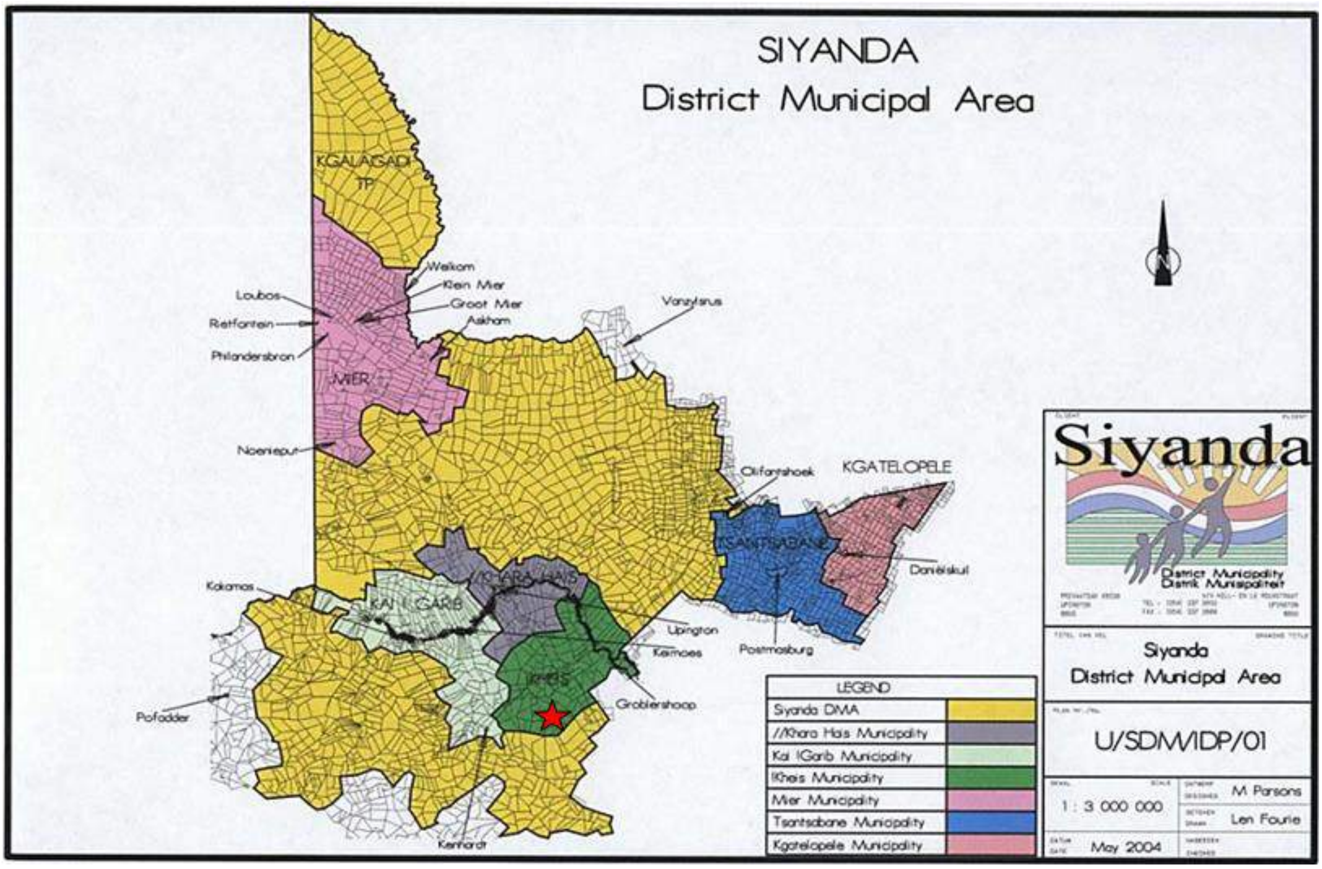

Figure 3.13: Siyanda DM (now known as ZF Mgcawu DM) boundary and boundaries of local municipalities (Siyanda DM IDP, 2013)

The !Kheis Local Municipality, in which the proposed project is located, has a population of 16 637, according to the 2011 Census (Statistics SA, 2015). As shown in Table 3.3, the !Kheis Local Municipality constitutes 8 % of the total population of the ZF Mgcawu DM.

Table 3.3: Population of the Local Municipalities within the ZF Mgcawu DM (Statistics SA, 2011)

Municipality	Census 2001	Census 2011	% of the total population	Difference	Area (Km^2)	Person/Km^2
Mier	7207	7003	3%	493	22468	0.3
Kai Garib	58 617	65 869	24%	799	26357	2.1
//Khara Hais	77 919	93 494	42%	25249	21780	4.6
!Kheis	16 538	16 637	8%	2797	11107	1.7
Tsatsabane	27 082	35 093	12%	4018	18330	1.5
Kgatelopele	14 743	18 687	9%	6755	2478	8.7
Total	**202 106**	**236 783**	**100%**	**35903**	**102520**	**2.3**

Afrikaans is the dominant language (76.4 %) and Setswana the second largest language (15.8 %) spoken in the ZF Mgcawu DM. Within the !Kheis Local Municipality 94 % of the population speaks Afrikaans and 1.9 % Setswana. The population of the ZF Mgcawu DM is predominantly Coloured (61.2 %), followed by Black Africans (29.8 %) and Whites (8.3 %), with the !Kheis Local Municipality containing a similar racial population group composition (as shown in Figure 3.14).

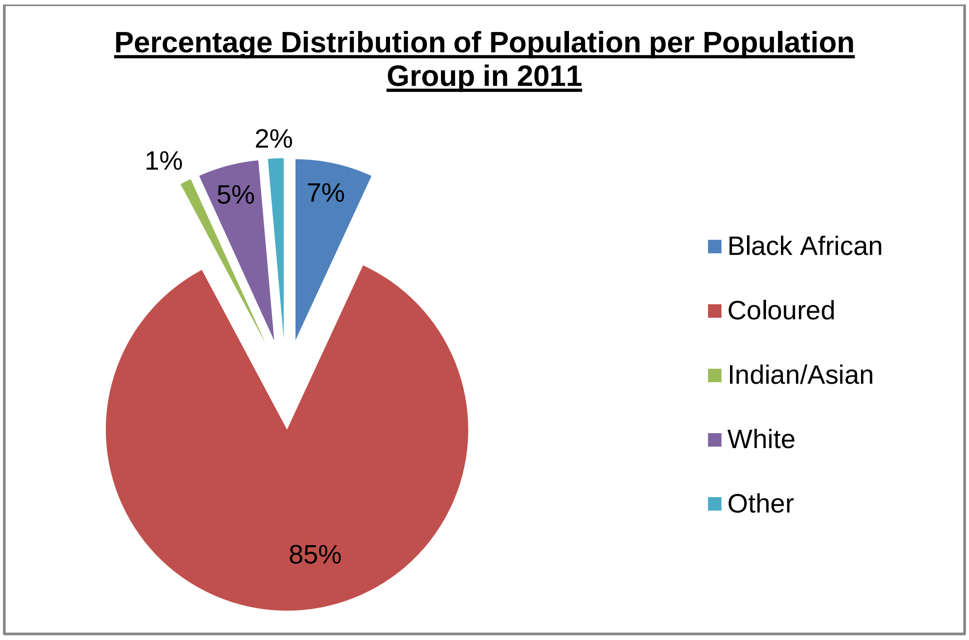

Figure 3.14: Percentage Distribution of Population per Population Group for the !Kheis Local Municipality in 2011 (Statistics South Africa, 2015).

The age distribution of the ZF Mgcawu DM (shown in Figure 3.15 below) is represented by a majority of young people, i.e. persons younger than 40 years old (Statistics SA, 2011).

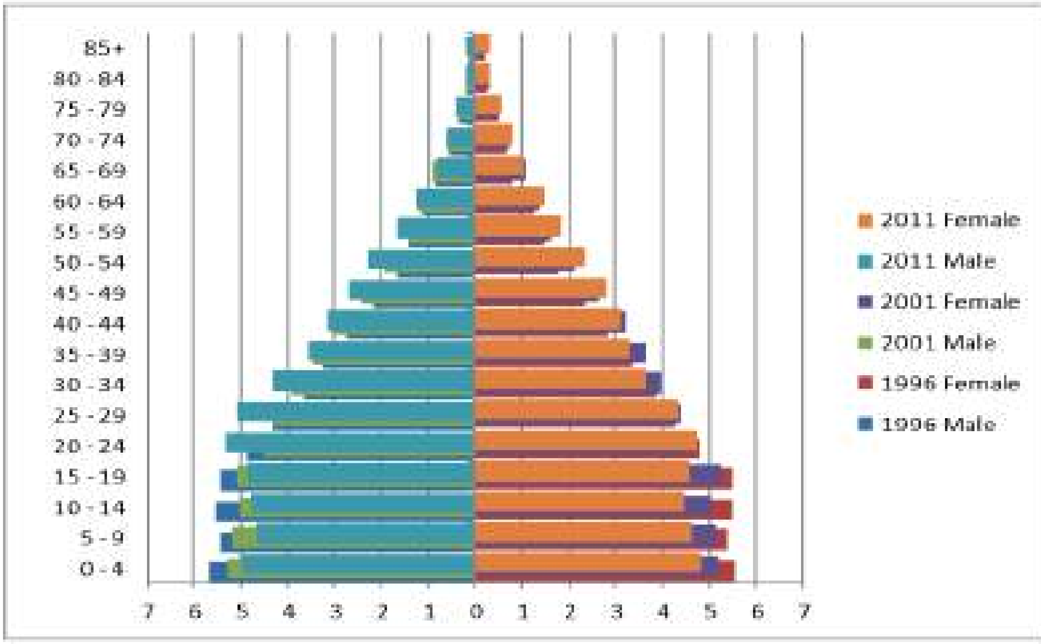

Figure 3.15: Age Distribution of the ZF Mgcawu DM (Statistics South Africa, 2011).

3.6.2. Economic Profile

The Northern Cape Province has the third highest per capita income of all nine provinces; however, income distribution is extremely skewed, with a high percentage of the population living in extreme poverty. Approximately 60 % of ZF Mgcawu DM's population has an income of between R 0 to R 800 per month. The majority of the population (i.e. 28.30%) within the !Kheis Local Municipality earns between the R 19 601 – R 38 200 income bracket, as shown in Figure 3.16 below, and approximately 7.7 % of the population has no income.

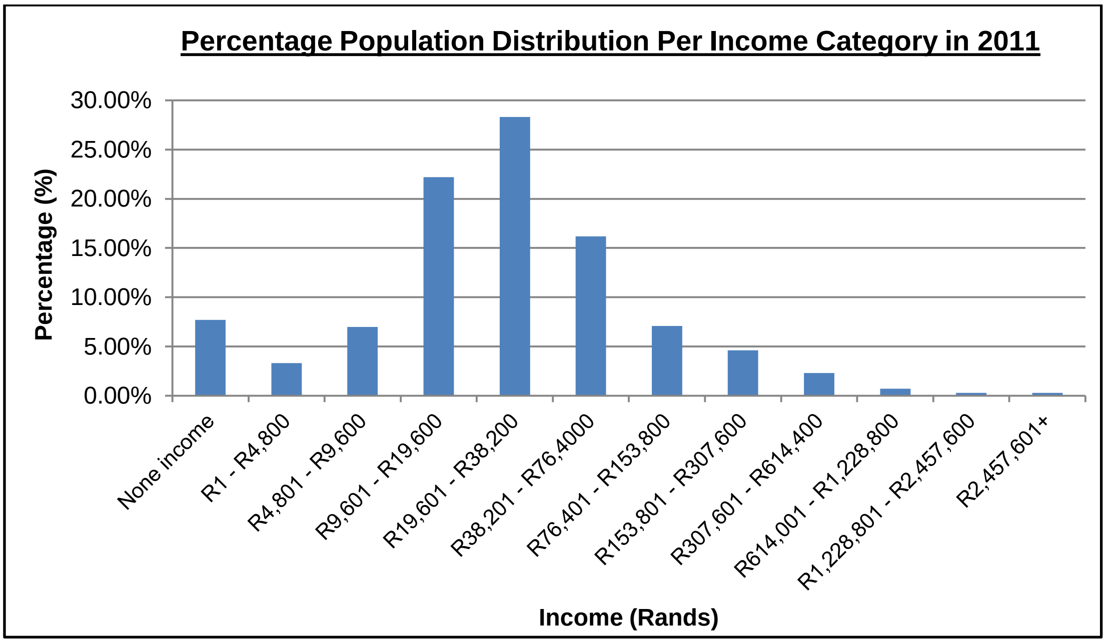

Figure 3.16: Income Distribution of the !Kheis Local Municipality in 2011 (Statistics South Africa, 2015).

The 2011 census indicates that 22 % and 34 % of the economically active population (between the ages of 15-34) in the ZF Mgcawu DM and the !Kheis Local Municipality, respectively, are unemployed. The !Kheis Local Municipality has the highest unemployment percentage of all the local municipalities falling within the ZF Mgcawu DM. Also, nearly a third of the population is economically inactive which suggests that individual and household incomes generated in the study area are being used to support a substantial amount of dependents. This in turn exacerbates the level of household vulnerability in the area.

The unemployment rate for the Kheis Local Municipality in 2001 was 20 % and in 2011 was 28 % (Statistics SA, 2015). The official unemployment rate of 10 % (based on the 2011 Census) has decreased by 6.1 % since the 2001 Census measurement of 16.1 % for the Kai !Garib Local Municipality. The economic sector is dominated by agriculture which provides 51.8 % of jobs, followed by the Community and Government Services sector with 15.9 %. The number of jobs generated by the agricultural sector needs to be interpreted within the context of the Kai !Garib Municipality. The vast majority of the land area occupied by the Kai !Garib Municipality consists of agricultural land, accordingly, it is unsurprising that agriculture would register as the major employer at municipal (i.e. regional) level.

However, the distribution of jobs within urban centers, like Kenhardt, does not necessarily follow this agriculturally dominated pattern. If the prevailing practice of predominantly male-oriented employment within the agricultural sector (specifically in terms of sheep farming) is assumed, the 51.8 % of jobs generated by the agricultural sector could in fact be heavily skewed towards men. This in turn is suggestive of a female dominated population which is heavily dependent on other economic sectors (i.e. non-agricultural sectors) for their income, and could very well imply that socio-economic impacts on urban centers, like Kenhardt, could be of more significance than farm-based impacts.

In terms of education, only 9.5 % of the total population of ZF Mgcawu DM has no formal schooling, while 13.5 % of the !Kheis Local Municipality's population is unschooled. Based on the 2011 Census, 3.1 % of the population of the !Kheis Local Municipality has no form of education, 55 % has some primary schooling, 7.5 % completed primary school, 5.7 % completed secondary school and 0.5 % has higher education, as shown in Figure 3.17 below.

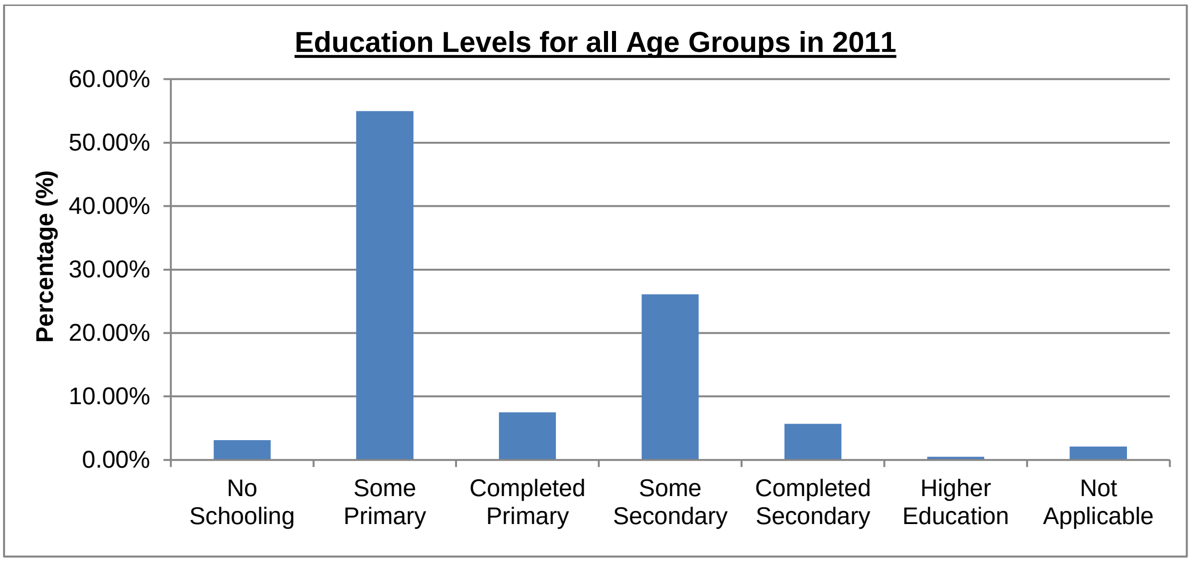

Figure 3.17: Education Levels of the !Kheis Local Municipality in 2011 (Statistics South Africa, 2015).

The economy of the ZF Mgcawu DM is dominated by mining and agriculture and accounts for up to 30 % of the Northern Cape's economy. Agriculture is the major industry in the district, contributing to job creation and economic growth. The region is characterised by livestock farming which occurs mainly on large farms that are managed for extensive production. The majority of these farms are privately owned. According to the !Kheis Local Municipality's IDP, the area is ideal for stock-farming, with the main focus being on sheep farming. The stock-farming industry also provides work to local people.

The ZF Mgcawu DM has a unique landscape that has the potential to contribute to and provide for a range of local and international tourist activities and destinations. The main attractions and destinations in the area are the Augrabies Falls National Park and the Kgalagadi Transfrontier Park. The presence of the Orange River is also a tourism asset providing several tourism opportunities. The natural appearance of the area also supports agricultural tourism. The ZF Mgcawu DM IDP indicates that tourism is one of the most important economic sectors in the Northern Cape as well as within the ZF Mgcawu DM boundaries. Tourism is a growing component of the economy of the Northern Cape and the IDP indicates that, after the agricultural sector, the local tourism industry should become the most important economic activity in the area within the next ten years. This is based on the current growth rate in both development and employment.

DRAFT
EIA
REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 4:

Approach to EIA Process and Public Participation

CONTENTS

TABLES

FIGURES

CHAPTER 4. APPROACH TO EIA PROCESS AND PUBLIC PARTICIPATION

This chapter presents the EIA Process to be conducted for the proposed development and gives particular attention to the legal context and guidelines that apply to this EIA, the steps in the Scoping and Public Participation component of the EIA (in accordance with Regulations 41, 42, 43 and 44 of GN R326), and the schedule for the EIA Process.

4.1. Legal Context for this EIA

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 R327, R326, R325 and R324 in Government Gazette 40772, dated 7 April 2017. The relevant Government Notices published in terms of the NEMA collectively comprise the NEMA EIA Regulations listed activities that require either a Basic Assessment, or Scoping and EIA (that is a "full EIA") be conducted. As noted in Chapter 1 of this Scoping Report, the proposed project requires a full EIA, as it particularly includes, *inter alia*, the inclusion of Listed Activity Number 1 in GN R325:

- *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area, or, on existing infrastructure".*

All the listed activities potentially forming part of this proposed development and therefore requiring EA were included in the Application Form for EA that was prepared and submitted to the DEA with the Draft Scoping Report. A copy of the letters of acknowledgement from the DEA have been included as Appendix O. The listed activities potentially triggered by the proposed project are indicated in Table 4.1.

Table 4.1: Listed Activities in GN R327 and GN R325 that potentially form part of the proposed Skeerhok PV 2 project

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity
	GN R327	
Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	Onsite infrastructure including underground cabling for collection of electricity, with a capacity of up to 132kV would be required to connect the proposed PV facility to the proposed onsite central 132 kV substation. The proposed facility is situated outside of the urban edge. This activity would therefore be triggered.
Activity 12 (x) and (xii)	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; or (ee) where such development occurs within existing roads or road reserves.	The proposed 100 MWac Solar PV facility 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.). Based on the preliminary sensitivity screening undertaken for the site, drainage features occur onsite and the buildings and infrastructure are expected to exceed a footprint of 100 m^2 and some may occur within 32 m of the watercourses. The proposed project will take place outside of an urban area. *Additional information regarding the presence of watercourses on site is provided in the Ecological & Hyrological Impact Assessment, which is attached to this report as Appendix I.*
Activity 19 (i)	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	The proposed project will 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 would also entail the infilling of more than 10 m^3 of material into the nearby watercourses. Based on the preliminary sensitivity screening undertaken for the site, drainage features occur on the farm. Construction of the internal gravel access road and/or the construction of infrastructure within

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity
	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 an existing ports or harbors that will not increase the development footprint of the port or harbor; or e) Where such development is related to the development of a port or harbor in which case activity 26 in Listing Notice 2 of 2014 applies.	drainage lines will require the removal of material. *Additional information regarding the presence of watercourses on site is provided in the Ecological & Hydrological Impact Assessment, which is attached to this report as Appendix I.*
Activity 24 (ii)	The development of a road– (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road– a) which is identified and included in activity 27 in Listing Notice 2 of 2014; or b) where the entire road falls within an urban area.	Existing roads will be used to gain access to the preferred site. The existing roads can be accessed from the R27. Existing internal gravel roads will be used where possible.The internal gravel road of 8 m in width. The proposed project will take place outside of an urban area.
Activity 28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	It is understood that the land is currently used for agricultural purposes (mainly grazing). The proposed 100 MWac solar PV facility (i.e. Skeerhok PV 2), which is considered to be a commercial/industrial development, will have an estimated footprint of approximately 300 ha.
	GN R325	
Activity 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area or on existing infrastructure.	The proposed project will entail the construction of a 100 MWac Solar PV facility (i.e. facility for the generation of electricity from a renewable resource). The proposed project take place outside of an urban area.
Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for: (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The proposed 100 MWac solar PV facility (i.e. Skeerhok PV 2) will have an estimated footprint of approximately 300 ha. As a result, more than 20 ha of indigenous vegetation would be removed for the construction of the proposed Solar PV facility. *Additional information regarding the presence of*

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity
		indigenous vegetation on site is provided in the Ecological Impact Assessment, which is attached as Appendix I.
	GN R324	
Activity 18	The widening of a road by more than 4 meters, or the lengthening of a road by more than 1 kilometer: g) Northern Cape ii) Outside Urban Areas: (ii)Areas within 100 meters from the edge of a watercourse or wetland.	This onsite farm road will be widened by more than 4 m. The proposed project will take place outside of an urban area.

Notes regarding the identification of potential listed activities:

- *It should be noted that a precautionary approach was followed when identifying listed activities (for inclusion in the Application for EA and to be assessed as part of the Scoping and EIA Process), i.e. if the activity potentially forms part of the project, it is listed. However, the project description as per the Final EIA report will be shaped by the findings of the EIA Process and certain activities may be added or removed from the project proposal. The DEA and I&APs will be informed in writing of such amendments accordingly.*

- *The relevant listed activities applicable to the construction of the proposed transmission lines and associated electrical infrastructure at the Eskom Nieuwehoop Substation will be included in the* ***separate BA Report*** *and the Applications for EA for the BA Process. As mentioned previously, the Applications for EA for the BA Processes will be lodged with the DEA during the EIA Phase, in order to comply with the timeframes stipulated in Regulation 19 (1) of GN R326.*

4.2. Legislation and Guidelines Pertinent to this EIA

The scope and content of this Draft EIA Report has been informed by the following legislation, guidelines and information series documents:

4.2.1. National Legislation

4.2.1.1. The Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution, which is the supreme law of the Republic of South Africa, provides the legal framework for legislation regulating environmental management in general, against the backdrop of the fundamental human rights. Section 24 of the Constitution 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 –
    - prevent pollution and ecological degradation;
    - promote conservation; and
    - secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

Section 24 of the Bill of Rights therefore guarantees the people of South Africa the right to an environment that is not detrimental to human health or well-being, and specifically imposes a duty on the State to promulgate legislation and take other steps that ensure that the right is upheld and that, among other things, ecological degradation and pollution are prevented.

In support of the above rights, the environmental management objectives of proposed project is to protect ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site.

4.2.1.2. NEMA and EIA Regulations published on 7 April 2017 (GN R327, GN R326, GN R325 and GN R324)

The NEMA sets out a number of principles (Chapter 1, Section 2) to give guidance to developers, private land owners, members of public and authorities. The proclamation of the NEMA gives expression to an overarching environmental law. Various mechanisms, such as cooperative environmental governance, compliance and non-compliance, enforcement, and regulating government and business impacts on the environment, underpin NEMA. NEMA, as the primary environmental legislation, is complemented by a number of sectoral laws governing marine living resources, mining, forestry, biodiversity, protected areas, pollution, air quality, waste and integrated coastal management. Principle number 3 determines that a development must be socially, environmentally and economically sustainable. Principle Number 4(a) states that all relevant factors must be considered, inter alia i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and viii) that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

4.2.1.3. National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for "the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection, and the use of indigenous biological resources in a sustainable manner, amongst other provisions". The Act states that the state is the custodian of South Africa's biological diversity and is committed to respect, protect, promote and fulfil the constitutional rights of its citizens.

Furthermore, NEMBA states that the loss of biodiversity through habitat loss, degradation or fragmentation must be avoided, minimised or remedied. The loss of biodiversity includes inter alia the loss of threatened or protected species. Biodiversity offsets are a means of compensating for the loss of biodiversity after all measures to avoid, reduce or remedy biodiversity loss have been taken. Chapter 5 of NEMBA (Sections 73 to 75) regulates activities involving invasive species, and lists duty of care as follows:

- the land owner/land user must take steps to control and eradicate the invasive species and prevent their spread, which includes targeting offspring, propagating material and regrowth, in order to prevent the production of offspring, formation of seed, regeneration or re-establishment;
- take all required steps to prevent or minimise harm to biodiversity; and
- ensure that actions taken to control/eradicate invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.

An amendment to the NEMBA has been promulgated, which lists 225 threatened ecosystems based on vegetation types present within these ecosystems. Should a project fall within a vegetation type or ecosystem that is listed, actions in terms of NEMBA are triggered. Based on the preliminary sensitivity screening undertaken for the proposed site, none of the threatened ecosystems occur within the study area. This will be confirmed as part of the Ecological Impact Assessment study undertaken during the EIA Phase.

4.2.1.4. The National Heritage Resources Act (Act 25 of 1999)

The National Heritage Resources Act (Act 25 of 1999) (NHRA) introduces an integrated and interactive system for the managements of national heritage resources (which include landscapes and natural features of cultural significance).

Parts of sections 35(4), 36(3) (a) and 38(1) (8) of the NHRA apply to the proposed project:

Archaeology, palaeontology and meteorites:
Section 35 (4) No person may, without a permit issued by the responsible heritage resources authority:

a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
c) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves:
Section 36 (3) (a) No person may, without a permit issued by South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority:

a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management:
38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as:
a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
b) the construction of a bridge or similar structure exceeding 50 m in length;
c) any development or other activity which will change the character of the site –
    (i) exceeding 5000 m^2 in extent, or
    (ii) involving three or more erven or subdivisions thereof; or
    (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural significance” as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value. Section 38 (2a) of the NHRA states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted.

A Heritage Impact Assessment (including Archaeology and Cultural Landscape) and a desktop Palaeontological Impact Assessment will be undertaken during the EIA Phase of the proposed project. These relevant specialist studies will be included in the EIA Reports that will be released to I&APs for review during the EIA Phase.

Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape) and the SAHRA are required to provide comment on the proposed project in order to facilitate final decision-making by the DEA. To this end and to facilitate comment from the relevant heritage authorities, the proposed project will be loaded onto the South African Heritage Resources Information System (SAHRIS) for comment. An application will be created for each project and all necessary project information was uploaded to the SAHRIS.

Once a final comment has been issued by the heritage authority, the recommendations should be included in the conditions of the EA (should it be granted). This will essentially give ‘permission’ from the heritage authorities to proceed. If any archaeological mitigation is required then this would need to be conducted by an appropriate specialist under a permit issued to that specialist by SAHRA. This permit has no bearing on the developer or development but is purely a way in which the heritage authority can be sure that the mitigation work will be carried out satisfactorily.

4.2.1.5. National Forests Act (Act 84 of 1998)

The National Forest Act (Act 84 of 1998) allows for the protection of certain tree species. The Minister has the power to declare a particular tree to be a protected tree. According to Section 12 (1) d (read with Sections (5) 1 and 62 (2) (c)) of the National Forest Act (Act 84 of 1998), a licence is required to remove, cut, disturb, damage or destroy any of the listed protected trees. The most recent list of protected tree species was published in November 2014. The Department of Agriculture, Forestry and Fisheries (DAFF) is authorised to issue licences for any removal, cutting, disturbance, damage to or destruction of any protected trees. The protected trees that commonly occur in this region are *Acacia erioloba* and *Boscia albitrunca*. The presence of these trees on site will be confirmed as part of the Ecological Impact Assessment to be conducted during the EIA Phase.

4.2.1.6. Conservation of Agricultural Resources Act (Act 43 of 1983)

The objectives of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) are to provide for the conservation of the natural agricultural resources of South Africa by the:

- maintenance of the production potential of land;
- combating and prevention of erosion and weakening or destruction of the water sources; and
- protection of the vegetation and the combating of weeds and invader plants.

The CARA states that no land user shall utilise the vegetation of wetlands (a watercourse or pans) in a manner that will cause its deterioration or damage. This includes cultivation, overgrazing, diverting water run-off and other developments that damage the water resource. The CARA includes regulations on alien invasive plants. According to the amended regulations (GN R280 of March 2001), declared weeds and invader plants are divided into three categories:

- Category 1 may not be grown and must be eradicated and controlled,
- Category 2 may only be grown in an area demarcated for commercial cultivation purposes and for which a permit has been issued, and must be controlled, and
- Category 3 plants may no longer be planted and existing plants may remain as long as their spread is prevented, except within the flood line of watercourses and wetlands. It is the legal duty of the land user or land owner to control invasive alien plants occurring on the land under their control.

Should alien plant species occur within the study area; this will be managed in line with the EMPr. Rehabilitation after disturbance to agricultural land is also managed by CARA. The DAFF reviews and approves applications in terms of these Acts according to their Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land, datedSeptember 2011.

4.2.1.7. National Water Act (Act 36 of 1998)

One of the important objectives of the National Water Act (Act 36 of 1998) (NWA) is to ensure the protection of the aquatic ecosystems of South Africa's water resources. Section 21 of this Act identifies certain land uses, infrastructural developments, water supply/demand and waste disposal as 'water uses' that require authorisation (licensing) by the Department of Water and Sanitation (DWS). Chapter 4 (Part 1) of the NWA sets out general principles for the regulation of water use. Water use is defined broadly in the NWA, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering the bed, banks, course or characteristics of a watercourse, removing water found underground for certain purposes, and recreation. In general a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. The Minister may limit the amount of water which a responsible authority may allocate. In making regulations the Minister may differentiate between different water resources, classes of water resources and geographical areas.

All water users who are using water for agriculture: aquaculture, agriculture: irrigation, agriculture: watering livestock, industrial, mining, power generation, recreation, urban and water supply service must register their water use. This covers the use of surface and ground water.

Section 21 of the Act lists the following water uses that need to be licensed:

a) taking water from a water resource;
b) storing water;
c) impeding or diverting the flow of water in a watercourse;
d) engaging in a stream flow reduction activity contemplated in section 36;
e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) disposing of waste in a manner which may detrimentally impact on a water resource;
h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i) altering the bed, banks, course or characteristics of a watercourse;
j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k) using water for recreational purposes.

Any activities that take place within a water course or within 500 m of a wetland boundary require a Water Use Licence (WUL) under the Section 21 (c) and Section 21 (i) of the NWA. The need for a Water Use Licence will be determined as part of the Ecological Impact Assessment, which will be conducted during the EIA Phase. However, it is important to note that considerable efforts will be made to place the proposed solar field and project infrastructure outside of wetland areas. The DWS will be consulted with during the EIA Process to confirm the need for a WUL, as well as to seek comment on the proposed project.

4.2.1.8. Astronomy Geographic Advantage (Act 21 of 2007)

The Astronomy Geographic Advantage (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;
- intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas; and
- matters connected therewith.

The overall purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province, excluding the Sol Plaatjie Municipality, has been declared an astronomy advantage area. The South African MeerKAT radio telescope is currently being constructed about 90 km north-west of Carnarvon in the Northern Cape Province. The MeerKAT radio telescope is a precursor to the Square Kilometre Array (SKA) telescope and will be integrated into the SKA Phase 1 (SKA South Africa, 2014).

The proposed Skeerhok PV 2 project is located approximately 43km north-east of Kenhardt. Kenhardt is located approximately 220 km from Carnarvon. According to the SKA Project Office, the nearest SKA station has been identified as SKA Station ID 2362, at approximately 20 km from the proposed project. Please see **Chapter 6, Section 6.10** for more information.

4.2.1.9. Subdivision of Agricultural Land Act (Act 70 of 1970)

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required.

4.2.1.10. Development Facilitation Act (Act 67 of 1995)

The Development Facilitation Act (Act 67 of 1995) (DFA) sets out a number of key planning principles which have a bearing on assessing proposed developments in light of the national planning requirements. The planning principles most applicable to the study area include:

- Promoting the integration of the social, economic, institutional and physical aspects of land development;
- Promoting integrated land development in rural and urban areas in support of each other;
- Promoting the availability of residential and employment opportunities in close proximity to or integrated with each other;
- Optimising the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;
- Contributing to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs;
- Promoting the establishment of viable communities; and
- Promoting sustained protection of the environment.

4.2.1.11. Other Applicable Legislation

Other applicable national legislation that may apply to the proposed project include:

- Electricity Act (Act 41 of 1987);
- Electricity Regulations Amendments (August 2009);
- Energy Efficiency Strategy of the Republic of South Africa (Department of Minerals and Energy (DME) now operating as Department of Mineral Resources (DMR), March, 2005);
- Promotion of Administrative Justice Act (Act 2 of 2000);
- Civil Aviation Act (Act 13 of 2009) and Civil Aviation Regulations (CAR) of 1997;
- Civil Aviation Authority Act (Act 40 of 1998);
- White Paper on Renewable Energy (2003);
- Integrated Resource Plan for South Africa (2010);
- Occupational Health and Safety Act (Act 85 of 1993), as amended by Occupational Health and Safety Amendment (Act 181 of 1993);
- Fencing Act (Act 31 of 1963);
- National Environmental Management: Air Quality Act (Act 39 of 2004);
- National Environmental Management: Protected Areas Act (NEM:PA) (Act 31 of 2004);
- National Environmental Management: Waste Management Act (Act 59 of 2008); and
- National Road Traffic Act (Act 93 of 1996).

4.2.2. Provincial Legislation

4.2.2.1. Northern Cape Nature Conservation (Act 09 of 2009)

The Northern Cape Nature Conservation Act (Act 09 of, 2009) and in particular the Northern Cape Conservation: Schedule 2 – Specially Protected Species has reference to the proposed project. This Act aims at improving the sustainability in terms of balancing natural resource usage and protection or conservation thereof. It includes six schedules, as follows:

- Schedule 1 - Specially Protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive Species.

With regards to protected flora, the Northern Cape Nature Conservation Act includes a list of protected flora. The plant species potentially present within the proposed project area will be identified as part of the Ecological Impact Assessment specialist study. However, it will be recommended as part of the EMPr, that a detailed plant search and rescue surveybe conducted before the final design process and prior to the commencement of the construction phase. If any of the listed species are found, the relevant permits should be obtained by the Project Applicant prior to their relocation or destruction. In addition, the Provincial Department of Environment and Nature Conservation should be consulted on whether a permit is required for the clearance of indigenous vegetation on site. The Provincial Department of Environment and Nature Conservation have been pre-identified as a key stakeholder and therefore included on the project database (as shown in Appendix C of this Scoping Report).

4.2.2.2. The Provincial Spatial Development Framework for the Northern Cape (Office of the Premier of the Northern Cape, 2012)

The Provincial Spatial Development Framework (PSDF) identified a Solar Corridor where solar projects will be given priority. According to the PSDF, this Solar Corridor “centres around Upington and extends from roughly Kakamas in the north to De Aar in the east” (Department of Co-operative Governance, Human Settlements and Traditional Affairs, 2012, Page 68). The spatial vision for the Northern Cape constitutes a coherently structured matrix of sustainable land-use zones that collectively support a dynamic provincial economy vested in the primary economic sectors, in particular, mining, agriculture, tourism, and the energy industry. Thus, the proposed project falls in line with the spatial development vision for the province.

4.2.3. Local Planning Legislation

4.2.3.1. ZF Mgcawu Spatial Development Framework (Siyanda DM 2012)

The Solar Corridor is seen as an initiative that ‘should be pursued vigorously.’ The corridor follows the main routes from Prieska to Upington and further along the N10. However, the Spatial Development Framework (SDF) map (Page 221) shows that the corridor also extended along the N14 west. There are also a number of solar energy projects outside these corridors. Proposal SB7 for Southern Bushmanland relates to solar projects: “Sensitively place solar projects within the Solar Corridor with due regard to the visual impact of these facilities and the siting principles in Section 6.3.7”.

4.2.3.2. !Kheis Rural SDF (!Kheis Municipality 2014)

Natural scenic beauty of the municipality and production of solar energy are both seen as opportunities based on its existing bio-physical conditions. Tourism opportunities for this municipality potentially relevant to the proposed development include agricultural tourism, landscape tourism and game farms. Solar energy projects are suggested for the remote areas of the municipality although no indication is given where this should be (other than the Solar Corridor).

4.2.3.3. Kai !Garib IDP (Kai !Garib Municipality 2014)

Kenhardt and its surrounding rural area are seen as an agricultural region with a scenic environment and important cultural heritage. Dust pollution is seen as factor that "must be taken into consideration with future developments". It was noted that the municipality is "very optimistic about the future due to the rise of Solar Energy Developments in the municipal area". The IDP concurred that climate of the municipal area is favourable to this environmental friendly source of energy.

4.2.3.4. Guidelines, Frameworks and Protocols

- Public Participation Guideline, October 2012 (Government Gazette 35769);
- DEADP and DEA Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline on Alternatives (DEA, 2014)
  - Guideline on Transitional Arrangements (DEADP, March 2013);
  - Guideline on Alternatives (DEADP, March 2013);
  - Guideline on Public Participation (DEADP, March 2013); and
  - Guideline on Need and Desirability (DEADP, March 2013);
- Information Document on Generic Terms of Reference for EAPs and Project Schedules (March 2013);
- Integrated Environmental Management Information Series (Booklets 0 to 23) (Department of Environmental Affairs and Tourism (DEAT), 2002 – 2005);
- Guidelines for Involving Specialists in the EIA Processes Series (DEADP; CSIR and Tony Barbour, 2005 – 2007);
- United Nations Framework Convention on Climate Change (1997); and
- Kyoto Protocol (which South Africa acceded to in 2002).

4.2.4. International Finance Corporation Performance Standards

In order to promote responsible environmental stewardship and socially responsible development, the proposed Skeerhok PV 2 project will, as far as practicable, incorporate the environmental and social policies of the International Finance Corporation (IFC). These policies provide a frame of reference for lending institutions to review of environmental and social risks of projects, particularly those undertaken in developing countries.

Through the Equator Principles, the IFC's standards are now recognised as international best practice in project finance. The IFC screening process categorises projects into A, B or C in order to indicate relative degrees of environmental and social risk. The categories are:

- Category A - Projects expected to have significant adverse social and/or environmental impacts that are diverse, irreversible, or unprecedented.
- Category B - Projects expected to have limited adverse social and/or environmental impacts that can be readily addressed through mitigation measures.
- Category C - Projects expected to have minimal or no adverse impacts, including certain financial intermediary projects.

Accordingly, projects such as the proposed Skeerhok PV 2 project are categorised as Category B projects. The EA Process for Category B projects examines the project's potential negative and positive environmental impacts and compares them with those of feasible alternatives (including the 'without project' scenario). As required for Category B projects a Scoping and EIA Process is being undertaken for the Skeerhok PV 2 project

Other Acts, standards and/or guidelines which may also be applicable will be reviewed in more detail as part of the specialist studies to be conducted for the EIA.

4.3. Principles for Public Participation

The PPP for this Scoping and EIA Process is being driven by a stakeholder engagement process that will include inputs from authorities, I&APs, technical specialists and the project proponent. Guideline 4 on "Public Participation in support of the EIA Regulations" published by DEAT 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.

- "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 healthy, 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 EIA 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.

4.4. Public Participation Process

The key steps in the PPP for the EIA Phase are described below. This approach has been confirmed with the DEA through their review and acceptance of the Plan of Study for EIA (as shown in Appendix O of this EIA Report). The PPP for the Scoping Process is described in Chapter 4 of the finalised Scoping Report (CSIR, 2017).

As discussed in Chapter 1 of this EIA Report, an integrated PPP will be undertaken for the three Scoping and EIA projects (i.e. Skeerhok PV 1, Skeerhok PV 2, and Skeerhok PV 3). Separate Scoping, BA and EIA Reports have been compiled for each project and these have been made available for I&AP and authority review in an integrated manner **(note: should there be a time period/date difference between the PPP for the EIA reports and the BA report, this will be clearly stipulated to I&Aps and catered for)**. All advertisements, notification letters and emails etc. will serve to notify the public 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. As previously noted, the BA Report has been released with the EIA Reports in order to comply with the timeframes stipulated in the 2014 EIA Regulations, as amended. This approach is proposed due to the close proximity of the sites (i.e. the proposed projects will take place within the same geographical area) and that proposed project will entail the same activity (i.e. generation of electricity with the use of solar PV panels).

The correspondence sent to I&APs during the Scoping Phase (including the submission of the finalised Scoping Reports to the DEA) is included in Appendix E of this EIA Report. Appendix G contains all the comments and correspondence received from I&APs during the Scoping Phase (i.e. during the Project Initiation Phase and 30-day review of the Scoping Reports). Appendices E and G will be respectively updated with correspondence sent to I&APs for the release of the EIA Reports, and any comments received from I&APs during the review of the EIA Report.

TASK 1: I&AP REVIEW OF THE EIA REPORT AND EMPR (CURRENT STAGE)

The first and current stage in the process entails the release of the Draft EIA Reports for a 30-day I&AP and stakeholder review period. Relevant organs of state and I&APs will be informed of the review process in the following manner:

- Placement of one advertisement in The Gemsbok local newspaper to notify potential I&APs of the availability of the DEIA Reports;
- A letter will be sent via registered mail and email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database. The letter will

include notification of the 30-day comment period for the EIA Reports, as well as an invitation to attend the public meeting and/or focus group meetings, if required.
- A public meeting could possibly be held during the review of the EIA Report, if warranted, and if there is substantial public interest during the EIA Phase. Furthermore, telephonic consultations with key I&APs will take place, upon request; and
- Meeting(s) with key authorities involved in decision-making for this EIA (if required and requested).

The DEIA Reports will be made available and distributed through the following mechanisms 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 to access for viewing;
- Key authorities will be provided with either a hard copy and/or CD of the EIA Reports;
- The EIA Reports will be uploaded to the project website (i.e. https://www.csir.co.za/environmental-impact-assessment) and
- Telephonic consultations will be held with key I&AP and organs of state groups, as necessary.

TASK 2: COMMENTS AND RESPONSES TRAIL

A key component of the EIA Process is documenting and responding to the comments received from I&APs and the authorities. The following comments on the EIA Reports will be documented:

- Written and emailed comments (e.g. letters and completed comment and registration forms);
- Comments made at public meetings and/or focus group meetings (if required);
- Telephonic communication with CSIR project team; and
- One-on-one meetings with key authorities and/or I&APs (if required).

The comments received during the 30-day review of the DEIA Reports will be compiled into a Comments and Responses Trail for inclusion in Appendix H to the EIA Reports that will be submitted to the National DEA in terms of Regulation 23 (1) (a) for decision-making. The Comments and Responses Trail will indicate the nature of the comment, as well as when and who raised the comment. The comments received will be considered by the EIA team and appropriate responses provided by the relevant member of the team and/or specialist. The response provided will indicate how the comment received has been considered in the EIA Reports for submission to the National DEA and in the project design and EMPRs.

TASK 3: COMPILATION OF EIA REPORTS FOR SUBMISSION TO THE DEA

Following the 30-day commenting period of the DEIA Reports and incorporation of the comments received into the reports, the Final EIA Reports (i.e. hard copies and electronic copies) will be submitted to the DEA for decision-making in line with Regulation 23 (1) of the 2014 amended EIA Regulations. 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 EIA Reports to the DEA for decision-making.

The EIA Reports that are submitted for decision-making will also include proof of the PPP that was undertaken to inform organs of state and I&APs of the availability of the EIA Reports for the 30 day review (during Task 1, as explained above). To ensure ongoing access to information, copies of the EIA

Reports that are submitted for decision-making and the Comments and Response Trail (detailing comments received during the EIA Phase and responses thereto) will be placed on the project website https://www.csir.co.za/environmental-impact-assessment)

The DEA will have 107 days (from receipt of the EIA Reports) to either grant or refuse EA (in line with Regulation 24 (1) of the 2014 amended EIA Regulations).

TASK 4: EA AND APPEAL PERIOD

Subsequent to the decision-making phase, if an EA is granted by the DEA for the proposed projects, all registered I&APs and stakeholders on the project database will receive notification of the issuing of the EA and the appeal period. The 2014 EIA Regulations, as amended (i.e. Regulation 4 (1) states that after the Competent Authority has reached a decision, it must inform the Applicant of the decision, in writing, within 5 days of such decision. Regulation 4 (2) if the 2014 EIA Regulations 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 following process will be followed for the distribution of the EA (should such authorisation be granted by the DEA) and notification of the appeal period:

- Placement of one advertisement in The Gemsbok local newspaper to notify I&APs of the EA and associated appeal process;
- A letter will be sent via registered mail and email to all registered I&APs 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 (https://www.csir.co.za/environmental-impact-assessment) and
- All I&APs on the project database will be notified of the outcome of the appeal period in writing.

4.5. Authority Consultation during the EIA Phase

Authority consultation is integrated into the PPP, with additional one-on-one meetings held with the lead authorities, where necessary. It is proposed that the Competent Authority (DEA) as well as other lead authorities will be consulted at various stages during the EIA Process. At this stage, the following authorities have been identified for the purpose of this EIA Process (additional authorities might be added to this list as the EIA Process proceeds):

- National DEA;
- Department of Environment and Nature Conservation of the Northern Cape Province;
- DWS of the Northern Cape Province;
- Department of Energy of the Northern Cape Province;
- Department of Mineral Resources of the Northern Cape Province;
- Eskom Holdings SOC Ltd;
- Transnet SOC Ltd;
- South African National Parks;

- Department of Social Development;
- National Energy Regulator of South Africa;
- National DAFF;
- DAFF of the Northern Cape Province;
- Department of Agriculture, Land Reform & Rural Development of the Northern Cape Province;
- Department of Public Works, Roads and Transport of the Northern Cape Province;
- Department of Labour;
- SKA;
- SAHRA;
- Ngwao Boswa Kapa Bokoni (Heritage Northern Cape);
- South African Civilian Aviation Authority;
- South African National Road Agency Limited;
- ZF Mgcawu District Municipality;
- Kai! Garib Local Municipality; and
- !Kheis Local Municipality.

The authority consultation process for the EIA Phase is outlined in Table 4.2 below.

Table 4.2: Authority Communication Schedule

STAGE IN EIA PHASE	FORM OF CONSULTATION
During the EIA Process	Site visit for authorities, if required.
During preparation of EIA Reports	Communication with the DEA on the outcome of Specialist Studies, if required
On submission of EIA Reports for decision-making	Meetings with dedicated departments, if requested by the DEA, with jurisdiction over particular aspects of the project (e.g. Local Authority) and potentially including relevant specialists.

4.6. Approach to Impact Assessment and Specialist Studies

This section outlines the assessment methodology and legal context for specialist studies, as recommended by the DEA 2006 Guideline on Assessment of Impacts.

4.6.1. Generic TOR for the Assessment of Potential Impacts

The identification of potential impacts should include impacts that may occur during the construction, operational and decommissioning phases of the development. The assessment of impacts is to include 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 will include:

- 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 EIA Reports as stipulated in Appendix 3 (3) (j) of the 2014 EIA Regulations, which states the following:

- An EIA Report must contain the information that is necessary for the CA 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 DEAT Guideline 5: Assessment of Alternatives and Impacts the following methodology is to be applied to the predication and assessment of impacts. Potential impacts should be 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. The DEA has stated that no more that 6 approved facilities in this area (within a 20 km radius) will be awarded preferred bidder status (due to the impact to the SKA). However, this assessment will be based on the precautionary approach i.e. assume that all projects will be developed within the area and therefore assuming worst case scenario.

Please see below a map **(Figure 4.6)** indicating projects that were **considered as part of the cumulative impact assessment.**

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

- **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).

- **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).

- **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)).

- **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) will be:
  - Yes: High reversibility of impacts (impact is highly reversible at end of project life);
  - Partially: Moderate reversibility of impacts; or
  - No: Impacts are non-reversible (impact is permanent).

- **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) will be:
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced);
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable (the affected resource is easy to replace/rehabilitate).

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

- **Probability** – The probability of the impact/risk occurring:
  - Very likely;
  - Likely;
  - Unlikely;
  - Very unlikely; and
  - Extremely unlikely.

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (as shown in Figure 4.1). This approach incorporates internationally recognised methods from the IPCC (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity. The significance is then rated qualitatively as follows against a predefined set of criteria (i.e. probability and consequence) as indicated in Figure 4.1:

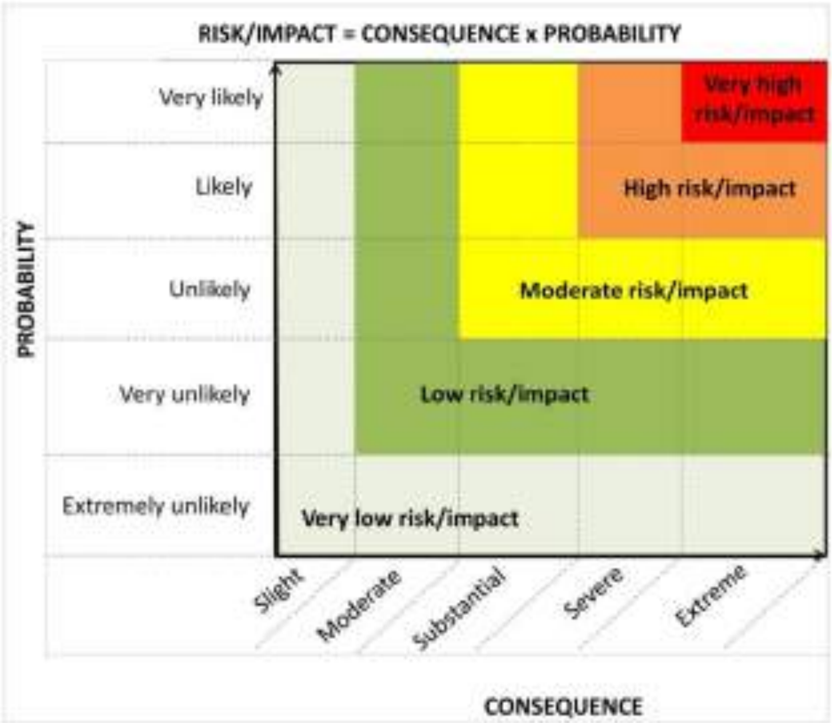

Figure 4.1: Guide to assessing risk/impact significance as a result of consequence and probability.

- **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 4.2):

- Very low = 5;
- Low = 4;
- Moderate = 3;
- High = 2; and
- Very high = 1.

- **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.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low;
  - Medium; or
  - High.

Impacts will then be collated into the EMPr and these will include the following:

- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include 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 will be stated.
- Positive impacts will be identified and augmentation measures will be identified to potentially enhance positive impacts where possible.

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

- Impacts will be evaluated for the construction and operation phases of the development. The assessment of impacts for the decommissioning phase will be 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 will be 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 will, where possible, take 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 will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

Table 4.3 is to be used by specialists for the rating of impacts.

Table 4.3: Example of Table for Assessment of Impacts

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 PHASE (EXAMPLE)													
Clearing of 300 ha of vegetation	Loss of Habitat and Species	Negative	Site Specific	Long term	Substantial	Very Likely	Yes	Moderate	Undertake Plant Search and Rescue prior to the commencement of construction	Moderate	Low	4	Medium
	Susceptibility of soil erosion on exposed surfaces	Negative	Site Specific	Medium term	Moderate	Likely	Yes	Moderate	Implement an Erosion Management Plan throughout the construction Phase	Moderate	Low	5	High

4.7. TORs for Cumulative Impact Assessment

Figure 4.2 below presents the known relevant projects within a 20km radius of the proposed Skeerhok PV 2 project. There are 14 solar PV projects in this radius including the 3 Skeerhok PV projects. DEA has stated that no more than 6 of these projects can be awarded preferred bidder status due to the constraints of the SKA project, but for the purposed of this cumulative impact assessment we have assumed the worst case scenario of all projects being built.

The cumulative impact assessment for each field of study have been detailed in the **sub-sections and relevant impact tables in Chapter 6.** The cumulative impacts have assessed by identifying other solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 20 kms of the proposed Skeerhok PV projects) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway.

The cumulative effects associated with these similar types of projects include inter alia

- Traffic generation;
- Avifaunal collisions and mortalities;
- Habitat destruction and fragmentation;
- Loss of agricultural land;
- Removal of vegetation;
- Increase in stormwater run-off and erosion;
- Increase in water requirements;
- Job creation;
- Increased interference to the SKA project;
- Social upliftment; and
- Upgrade of infrastructure and contribution of renewable energy into the National Grid.
- EMI concerns on the SKA

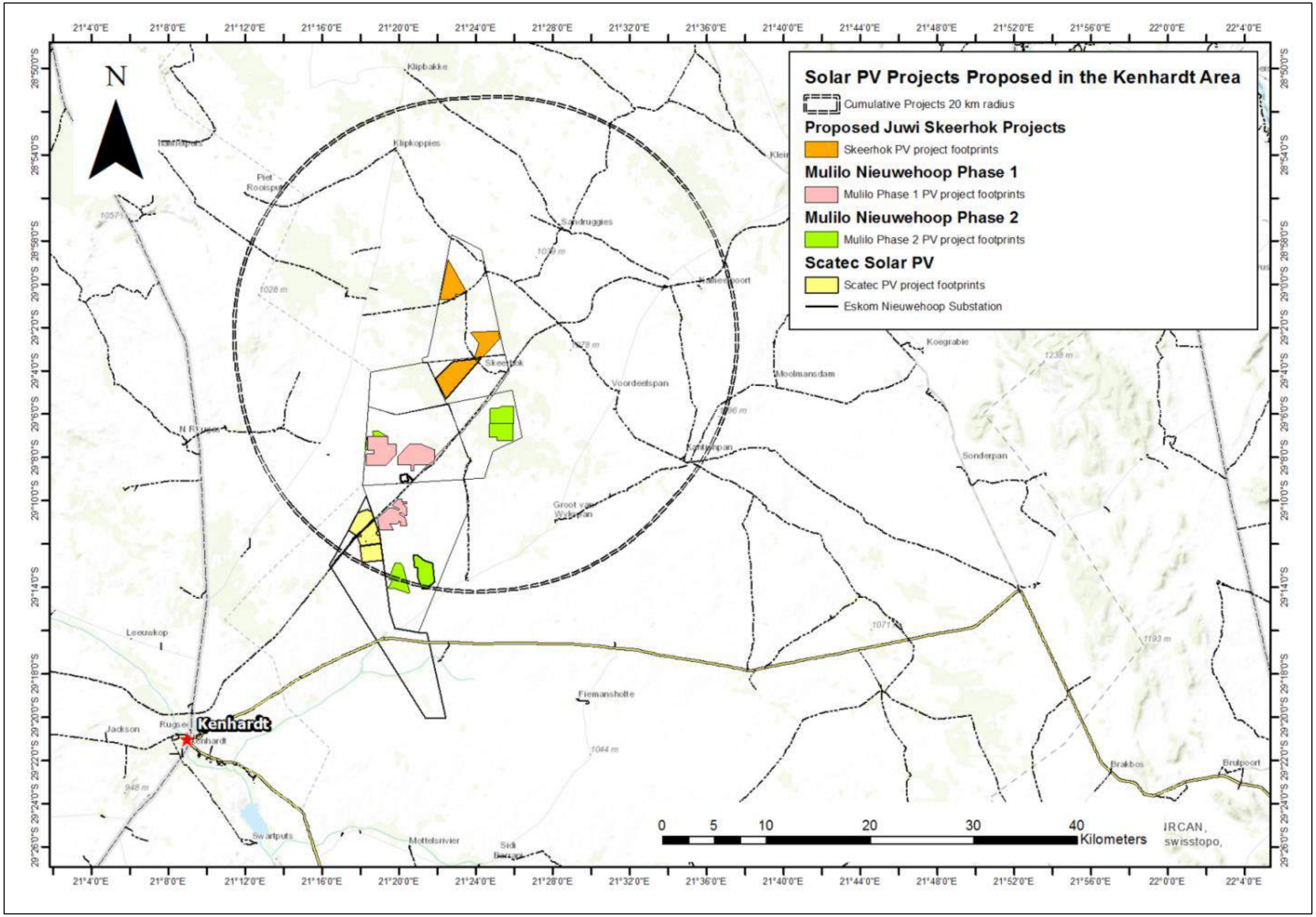

Figure 4.2: Cumulative locality map for projects within a 20km radius of the proposed Skeerhok PV 1, 2 and 3 projects

4.8. TORs for the Specialist Studies

The TORs for the specialist studies will essentially consist of the generic assessment requirements and the specific issues identified for each discipline. The Specialists Reports can be seen attached as **Appendices I to N** to this DEIAR.

The following specialist studies have been identified based on the issues identified to date, as well as potential impacts associated with the project. The TORs for each specialist study is discussed in detail below. The specialist studies and associated specialists are shown in Table 4.4 below. It is important to note that due to the large number of existing studies completed in the area, as well as the large amount of research and information that is readily available, certain specialist studies (i.e. agricultural potential, traffic and social) have not been commissioned, however, traffic, agricultural potential and social impact statement will be compiled by the EAP, based on existing studies undertaken in the area, and reviewed by suitably qualified specialists.

Table 4.4: Specialist Studies and Associated Specialists

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Simon Bundy	Sustainable Development Projects (SDP)	Ecological Impact Assessment (including Terrestrial and Aquatic Ecology)
Jon Smallie	Wild Skies Ecological Services	Avifauna Impact Assessment
Luanita Snyman-Van der Walt	CSIR	Visual Impact Assessment
Andrea Gibb	SiVEST	External review of the VIA
Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
Christo Bredenhann	WSP	Review of the Traffic Impact Statement complied by the CSIR using exisiting studies in the project area.
Rudolph du Toit	N/A	Review of the Social Impact Statement complied by the CSIR using exisiting studies in the project area.
Johann Lanz	N/A	Review of the Soils and Agricultural Impact Statement complied by the CSIR using exisiting studies in the project area.

Cumulative impacts have been assessed in the specialist studies (as applicable) by considering the 6 approved facilities in this area (within a 20 km radius) which may be awarded preferred bidder status (due to the impact to the SKA), as stated by the DEA. The cumulative impacts have been assessed in terms of each proposed Skeerhok PV projects as well.

A Square Kilometre Array (SKA) RFI Study has been commissioned for the proposed juwi Solar PV projects(s) in Kenhardt. This study has not complied with the requirements of Appendix 6 of the EIA Regulations, since it is a technical assessment to inform the SKA’s comment and not an environmental issue required to be addressed via the requirements of the 2014 EIA Regulations, as amended. The Terms of Reference for this study are included in Section 7.8.6 below. **The full RFI study is attached as Appendix P.**

4.8.1. Ecological Impact Assessment

Chapter 6 of the Final Scoping Report highlighted the issues that will be addressed in the Ecological Impact Assessment as part of the EIA Phase of the proposed project. Based on the issues identified, the potential impacts arising should be considered in terms of both the construction and operational phases, where the former is to be considered a short term, rapid impact of varying severity, while the latter is considered to have longer term, more subtle changes in the habitats/sites in question. Impacts are considered to be both negative and positive in nature, depending upon the approach to such issues. The impacts arising as a consequence of the implementation of the proposed project have been considered through the undertaking of a **detailed Ecological Impact Assessment (including terrestrial ecology and hydrology)** which is attached to this report as Appendix I. The findings of the Ecological Impact Assessment have been utilised to identify the most appropriate layout of the site within the development footprint, or any significant or fatal flaws that may arise within a particular site and the preferred layout of the project within the site.

The Ecological Impact Assessment has therefore be undertaken with the following broad TORs as follows:

- Identification of baseline ecological parameters, based upon the floral and faunal state of the preferred site;
- Consideration of ecological drivers upon the proposed sites;
- Consideration of possible changes in drivers as well as direct impacts that would arise as a consequence of the establishment of the proposed facility;
- Identification of significance of such change and integration into impact evaluation methods.
- Provide clearly defined and rated cumulative impacts and where, applicable, quantify the cumulative impact;
- Consideration of mitigation or avoidance measures that may be employed to obviate negative impacts that are identified in the evaluation processes; and
- Final consideration of planning and layout, as well as operations, will be undertaken to assist with the employment of the abovementioned mitigation measures.
- Cumulative Environmental Impact Statement on whether the proposed development must proceed.

Overall, the study includes the following tasks:

- Review detailed information relating to the project description and precisely define the environmental risks to the terrestrial environment and consequences for ecology;
- Draw on desktop information sources, the knowledge of local experts, information published in the scientific press and information derived from relevant EIAs and similar specialist studies previously conducted within the surrounding area;
- Compile a baseline description of the terrestrial ecology of the study area, and provide an overview of the entire study area in terms of ecological significance and sensitivity. The description will include the major habitat forms within the study sites, giving due consideration to terrestrial ecology (flora) and terrestrial ecology (fauna). The desktop review will be undertaken using spatial data, SANBI conservation data, as well as other related information;
- Provide specific ecological data in respect of the floral components of the site using ground-truthing methods, with an emphasis on those areas considered to be of “high” and possibly, “moderate” sensitivity (based on the desktop study);
- Based on the desktop study, undertake field work and spot sampling across the site to record relevant data and to compile an overview of the habitat under review. The field assessment will aim to confirm the nature and structure of the habitat within the study area from an ecological

perspective, and it will aim to identify key ecological components within the study area and in specific, the sensitivity of the prevailing habitat, as well as the identification of any floral components worthy of consideration;
- Collate all data collected during the field work and undertake a statistical review using methodologies that allows for comparison of biological data;
- Incorporate relevant information from other specialist reports/findings if required;
- Provide a detailed terrestrial and aquatic ecological sensitivity map of the site, including mapping of disturbance and transformation on site;
- Identify and rate potential direct, indirect and cumulative impacts on the terrestrial ecology, communities and ecological processes within the site during the construction, operation and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts proposed solar facilities, together with the impact of the proposed project;
- Provide input to the EMPr, including mitigation and monitoring requirements to ensure that the impacts on the terrestrial ecology are limited; and
- Compile an assessment report qualifying the risks and potential impacts on terrestrial ecology in the study area and impact evaluations.

It is important to note that all investigations and interpretation of results will be subject to findings during site reconnaissance, where after methods described above may vary to accommodate such findings.

4.8.2. Visual Impact Assessment

The assessment has followed guidelines for Visual Impact Assessments provided by the Provincial Government of the Western Cape (PGWC) and CSIR (Oberholzer, 2005), and the Landscape Institute of the UK (GLVIA, 2002). Land Planning guides, Spatial Development Frameworks, and IPDs and other documentation relevant to the region will be referenced as part of the study.

The overall objectives of the Visual Impact Assessment specialist study are to identify and investigate potential visual impacts associated with the development of a large solar energy facility and its infrastructure near Kenhardt in the Northern Cape (Report attached as Appendix M). The Visual Impact Assessment has therefore::

- Describe, in sufficient detail, the existing landscape and visual conditions of the surrounding region to form a baseline against which impacts can be measured and compared;
- Identify potential visual impacts that may occur during construction, operational and decommissioning phases of the development, as well as future potential impacts that may occur if the plant is not developed (the “no go” option), both positive and negative impacts;
- Provide clearly defined and rated cumulative impacts and where, applicable, quantify the cumulative impact;
- Assess the severity and significance of the potential impacts in terms of direct, indirect and cumulative impacts;
- Provide recommendations with regards to potential monitoring programmes;
- Determine mitigation and/or management measures which could be implemented to reduce the effect of negative impacts, or enhance the effect of positive impacts, as far as possible; and
- Incorporate and address issues and concerns raised during the Scoping Phase of the EIA where they are relevant to the specialist’s area of expertise.

- Provide a cumulative Environmental Impact Statement on whether the proposed development must proceed.

The Visual Impact Assessment has been undertaken in the following manner:

- Desktop Review and Analysis
  - A Geo-Information System (GIS) exercise will be undertaken to quantify the visual impacts because of the development of the proposed SEF.

- Impact Assessment, Mitigation and Report Writing
  - Potential direct, indirect and cumulative visual impacts will be identified and assessed for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.
  - Compile a Visual Impact Assessment report that will focus on measures to reduce negative aspects, compensatory measures to offset negative aspects, and enhancement of positive aspects. Indicators for monitoring the efficacy of mitigation measures will be suggested (for inclusion in the EMPr).
  -

NOTE: The Visual Impact Assessment was done in-house, and thus has been externally reviwed by a qualified specialist. Pleease see Appendix M for the review letter and CV of the specialist attached. It must be noted that the reccomondations for edits to be made to the VIA **have been made** post external review. Appendix M reflects those requested changes by SiVEST.

4.8.3. Heritage Impact Assessment (Archaeology and Cultural Landscape)

The following broad TOR has been specified for the Heritage Impact Assessment (including Archaeology and Cultural Landscape) to be undertaken during the EIA Phase (Report attached as Appendix K):

- Prepare and undertake a desktop study on the fossil heritage, archaeology, and heritage sites within the proposed project area.
- Undertake a detailed field examination of the archaeological sites and heritage features within or in the region of the development area.
- Describe the type and location of known archaeological sites and in the study area, and characterise all heritage items that may be affected by the proposed project.
- Describe the baseline environment and determine the status quo in relation to the specialist study.
- Record sites of archaeological relevance (photos, maps, aerial or satellite images, GPS co-ordinates, and stratigraphic columns).
- Evaluate the potential for occurrence of archaeological features within the study area.
- Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the archaeological heritage for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.
- Compile a report providing a review of archaeological heritage within the study area based on desktop study and new data from fieldwork and analysis.
- Provide recommendations and suggestions regarding archaeological heritage management on site, including conservation measures to ensure that the impacts are limited.

- Provide input to the EMPr, including mitigation measures and monitoring requirements to ensure that the impacts on the archaeology are limited.
- Provide clearly defined and rated cumulative impacts and where, applicable, quantify the cumulative impact;
- Provide a cumulative Environmental Impact Statement on whether the proposed development must proceed.

4.8.4. Desktop Palaeontological Impact Assessment

Based on the low palaeontological sensitivity of the area a desktop Palaeontology Impact Assessment has been conducted. The Palaeontology Impact Assessment has been used to identify possible palaeontological sites or features by making use of desktop sources (Report attached as Appendix L). The study has assessed the significance of such sites, described the possible impact of the proposed project on these sites and provided recommendations for mitigation or monitoring measures where applicable. The desktop study has been conducted in accordance with the requirements of the NHRA.

4.8.5. Avifauna Assessment

The activities that will be undertaken as part of the construction and operation phases of the proposed Skeerhok PV 2 project that will result in potential impacts to avifauna species, and thus bird monitoring has been undertaken (pre-scoping) to understand these impacts up front. The following broad TOR has been specified for the Avifaunal Impact Assessment that has been undertaken during the EIA Phase (Report attached as Appendix J):

- Incorporate more on site data, from all 3 monitoring site visits;
- Provide greater confidence in the findings;
- Develop a site sensitivity map;
- Provide clearly defined and rated cumulative impacts and where, applicable, quantify the cumulative impact;
- Assesse the cumulative impacts of the proposed development when considering other developments in the area and;
- Develop an operational phase monitoring framework.
- Provide a cumulative Environmental Impact Statement on whether the proposed development must proceed.

NB: It is important to note that the study has been conducted according to the best practice guidelines for "assessing and monitoring the impact of solar power generating facilities on birds in Southern Africa" compiled by **BirdLife** in **January 2017.** Compliance with these guidelines has been included in the Avifaunal Specialist Study which is attached as **Appendix J.**

4.8.6. SKA RFI Study

The full RFI study is attached as **Appendix P.** The Terms of Reference for the Radio Interference Study for the Square Kilometer Array can be seen below:

Terms of reference for the Risk evaluation of the Skeerhok PV 2, 2 and 3 Plants to SKA antenna installations
KEYWORDS
System Level EMC, EMC Environment, SKA
DISTRIBUTION
Juwi Renewable Energies (Pty) Ltd

EXECUTIVE SUMMARY
A high level risk assessment of the potential impact of the proposed Skeerhok developments on the current SKA installation location information will indicate the level of additional mitigation (if any) that will be required based on the proposed design and possible technology partners. Natural terrain barriers such as hills will provide additional shielding between the SKA installations and the proposed plant. This will be presented in the assessment for the worst case scenarios.

4.8.6.1. Background

Three possible locations, Skeerhok 1, Skeerhok 2 and Skeerhok 3 have been identified for a Photovoltaic (PV) development by juwi Renewable Energies (Pty) Ltd. The technology partners are not yet confirmed so assumed technologies were utilised in line with best practise at the time of commissioning the study.

The SKA is a stakeholder mentioned in the Environmental Authorisation of the proposed project. In order to determine whether the planned solar development could have any influence on the SKA, juwi Renewable Energies (Pty) Ltd requested a risk evaluation of the planned development to SKA activities.

4.8.6.2. Scope

This assessment will be a high level desktop study and can be updated based on additional measurement results and design information as it becomes available

4.8.6.3. Intent

The intent of this evaluation is to ensure that the Skeerhok PV facilities pose a low risk of detrimental impact on the SKA by comparing the anticipated emissions from equipment complying to the CISPR 11/22 limits minus the path loss due to distance and terrain to the protection levels required by SKA to ensure interference free operations. Should additional mitigation (shielding and filtering) be required it will be quantified in the report.

4.8.6.4. Methodology

This phase of assessment is based on laboratory tested radio frequency emissions to determine technology risks (power conversion, trackers control systems, etc.) of the renewable energy system and the measurements at a representative site. A second phase of post construction monitoring will be required to confirm results or provide further input. The proposed site of the renewable energy installation is plotted with reference to the closest of the MeerKAT, SKA Phase 1 and SKA Phase 2 telescope locations.

The expected loss as determined by the Irregular Terrain Model [4] (Longley Rice model applicable for frequencies between 20MHz and 20GHz) between the proposed site and nearest SKA stations will be presented in the final report. The reduction in power density of an electromagnetic wave as it propagates is a function of free-space loss (natural expansion of the wave front in free space (i.e. distance between source and receiver), diffraction loss (part of the wave front is obstructed by an obstacle, in this case terrain such as a hill), vegetation and foliage (environment) and the propagation medium (dry/ moist air in this case) to name a few.

Although reference is made to CISPR 11 and CISPR 22, it should be noted that the quasi-peak detector used for CISPR tests will result in low amplitudes being recorded for signals with a low pulse repetition rate. Due to the number of potential sources on the plant and the characteristics of a radio telescope, peak detection (max hold function) has been used when evaluating impulse signals with low repetition rates.

A large number of non-correlated noise sources (inverters, PV panel controls etc.) could increase the noise floor at a receiving site distant from the noise sources, therefor the cumulative effects needs to be addressed.

Assuming that the emissions from each Skeerhok PV plant is attenuated in accordance with an EMC Process Control Plan, such that the individual PV plants will not result in interference at the SKA, then the Skeerhok PV plants are expected to have minimal/ negligible contribution to the potential cumulative impact to the SKA.

4.9. Schedule for the EIA

The proposed schedule for the EIA, based on the legislated EIA Process, is presented in Table 4.5. It should be noted that this schedule could be revised following the comment period on this Draft EIA report, depending on factors such as the time required for decisions from authorities.

Table 4.5: Schedule for the Proposed juwi Skeerhok PV Projects (including the Scoping and EIA Projects and the BA Project)

juwi Kenhardt Solar PV EIAs &BA 2017/18 project schedule		May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18
Phase	**Task**	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Inception Phase	Officially commence with project juwi & CSIR kick-off meeting)																
	Procure and appoint specialists																
End of Inception Phase																	
Scoping Phase	Specialists to provide description of receiving environment and Terms of Reference for inclusion in the Scoping Reports																
	Prepare Scoping Reports and Plan of Study for EIA (PSEIA)																
	Prepare EA application forms																
	juwi Review																
	Draft Scoping Reports public review period and submission of application																
	Collate comments received and integrate into Final Scoping Reports																
	juwi Review																
	Submission of Scoping Reports and PSEIA to Competent Authority																
	Competent Authority to Accept Scoping Reports or Refuse EA																
End of Scoping Phase																	
EIA Phase	Specialist to provide EIR input based on comments received																
	Compile EIRs and EMPRs.																
	Compile BA and EMPr																
	Prepare EA application form (BA)																
	juwi Review																
	EIRs and BA Report public review period.																
	Collate comments received and integrate into EIRs and BA report.																
	juwi Review																
	Submission of final EIRs and Ba Report to Competent Authority																
End of EIA Phase																	
Decision Phase	Competent Authority to Grant or Refuse EA																
	Competent Authority to provide written feedback																
	Notify I&APs of the EA decision																

(yellow)	Public Participation Process
(blue)	CSIR (EAP) timeframes
(green)	DEA (Competent Authority) timeframes
(lilac)	Specialist studies
(hatched)	Compulsory PPP exclusion period
(peach)	juwi review timeframe

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 5:

Project Alternatives

CONTENTS

TABLES

FIGURES

CHAPTER 5. APPROACH TO THE ASSESSMENT OF ALTERNATIVES

This chapter discusses the alternatives that have been considered as part of the EIA Phase. The 2014 amended EIA Regulations (GN R326) define “alternatives”, in relation to a proposed activity, “as different means of meeting the general purpose and requirements of the activity, which may include alternatives to the:

- property on which or location where the activity is proposed to be undertaken;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity; or
- operational aspects of the activity; and
- includes the option of not implementing the activity.

The Scoping Report was required to provide a full description of the process followed to reach the proposed preferred activity, site and location within the site, including details of all the alternatives considered and the outcome of the site selection matrix.
Appendix 2 of the 2014 amended EIA Regulations provides the following objectives of the Scoping Process in relation to alternatives:

- To identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process; and
- To identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment.

For additional information regarding the alternatives that were considered during the Scoping Phase, refer to the finalised Scoping Report (CSIR, 2017).

Sections 24(4) (b) (i) and 24(4A) of the NEMA require an EIA to include investigation and assessment of impacts associated with alternatives to the proposed project. In addition, Section 24 O(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.

5.1. Assessment of Alternatives

5.1.1. 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 Skeerhok PV 2 project. 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 100 MWac facility is predicted to generate just over 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 17 800 MW by 2030;
- No potential impact to the SKA project;
- Additional power to the local grid will need to be provided via the Eskom grid, with approximately 90% coal-based power generation with associated high levels of CO_2 emissions and water consumption;
- 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;
- Local communities will continue their dependence on agriculture production and government subsidies. The local municipality's vulnerability to economic downturns will increase because of limited access to capital;
- There will be no opportunity for additional employment in an area where job creation is identified as a key priority. Approximately 1600 (600 direct and 1000 indirect) employment opportunities will be created during the construction period and 200 (50 direct and 150 indirect) employment opportunities will be created during the operation period of the proposed project;
- 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 REIPPPP 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:

- There will be no development of solar energy facilities at the proposed location;
- Only the agricultural land use will remain;
- No vegetation will be removed or disturbed during the development of these facilities;
- No change to the current landscape will occur;
- No heritage artefacts will be impacted on; and
- No additional water use during the construction phase and the cleaning of panels during the operational phase.

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 also 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 currently the preferred alternative.

5.1.2. Land-use Alternatives

5.1.2.1. Agriculture

At present the proposed site is zoned for agricultural land-use, and is mainly used for livestock grazing. As noted in Chapter 3 of this Environmental Impact Assessment 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. There has been an extensive amount of research conducted in the area for similar facilities and no agriculturally sensitive areas were identified within the area under consideration. Hence, agricultural land use is not a preferred alternative.

5.1.2.2. Renewable Energy Alternatives

Where the "activity" is the generation of electricity, possible reasonable and feasible land-use alternatives for the proposed properties include Biomass, Hydro Energy and Wind Energy. However, based on the preliminary investigations undertaken by the Project Applicant, no other renewable energy technologies are deemed to be appropriate for the site. The unsuitability of other renewable energy developments for the site, as well as the potential risks and impacts of each, is discussed below.

Biomass Energy
The proposed project site lacks any abundant or sustainable supply of biomass. According to the South African Renewable Energy Resource Database (SARERD), the project site is identified as having no cumulative biomass energy potential (as shown in Figure 5.1), therefore, the implementation of a Biomass Facility at the proposed site in the Northern Cape is therefore considered to be an unfeasible and unreasonable alternative to the implementation of the proposed solar PV energy facility.

Should biomass energy be selected for the site, significant negative socio-economic implications could be created as it would not be feasible in terms of operations. A biomass facility is also likely to result in unnecessary pollution due to waste generation (especially waste water generated during the operational phase of the biomass facility), traffic impacts and air emissions as a result of operations. A biomass facility is likely to create traffic impacts as the material required for the plant (i.e. biomass) would need to be transported to the site on a regular basis during the relevant seasons

Hydro Energy
The proposed project site lacks any large inland water bodies, which precludes the possibility of renewable energy from small/large scale hydro generation. In terms of micro hydro power potential, the SARERD has classified the proposed project site as "Not Suitable" (as shown in Figure 5.2), therefore, the implementation of a Hydro Energy Facility at the proposed site is also considered to be an unfeasible and unreasonable alternative to the implementation of the proposed solar PV energy facility.

Hydro power is also not noted as a renewable energy source in terms of the municipal IDP.. If a hydro power was to be constructed instead of a solar facility, it will create significant negative socio-economic implications as it would not be feasible in terms of operations at this site location.

Wind Energy
Wind energy is considered to be the most feasible alternative to solar energy when compared to biomass and hydro energy; however the site specific requirements of wind energy facilities make it a less feasible

alternative when compared to solar PV. Measurements provided by the Wind Atlas of South Africa (WASA) indicate that the mean wind speed is the highest at the coastal regions of South Africa (as shown in Figure 5.3), and therefore, this alternative is not preferable over solar energy.

Wind energy facilities require that wind turbines are spaced a significant distance from one another. Due to the fact that there is only a certain amount of land available for development, the implementation of a wind energy facility would not make optimum use of that land which is available.

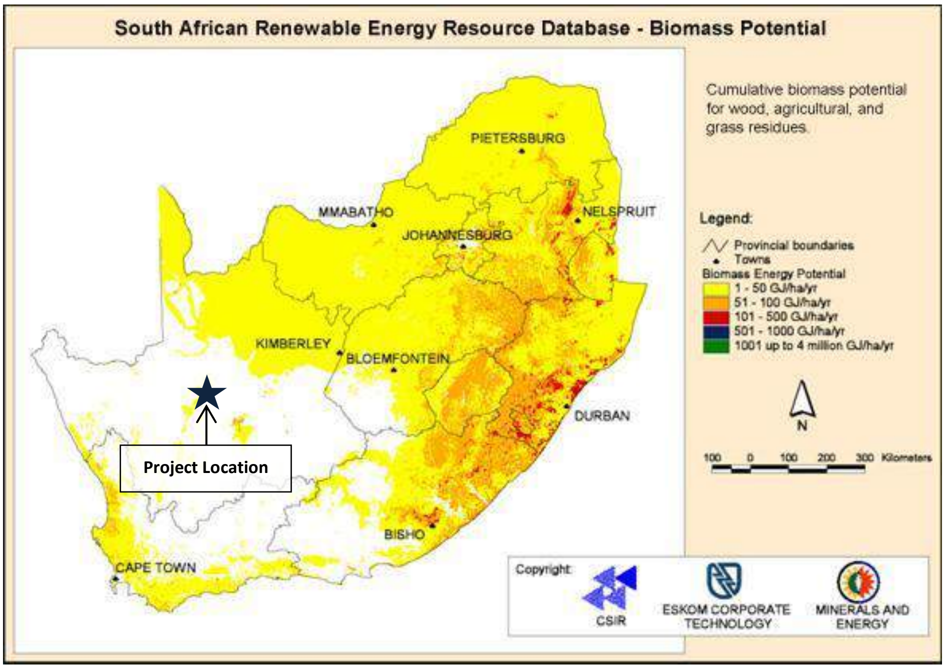

Figure 5.1: Biomass Potential (Source: SARERD, 2016)

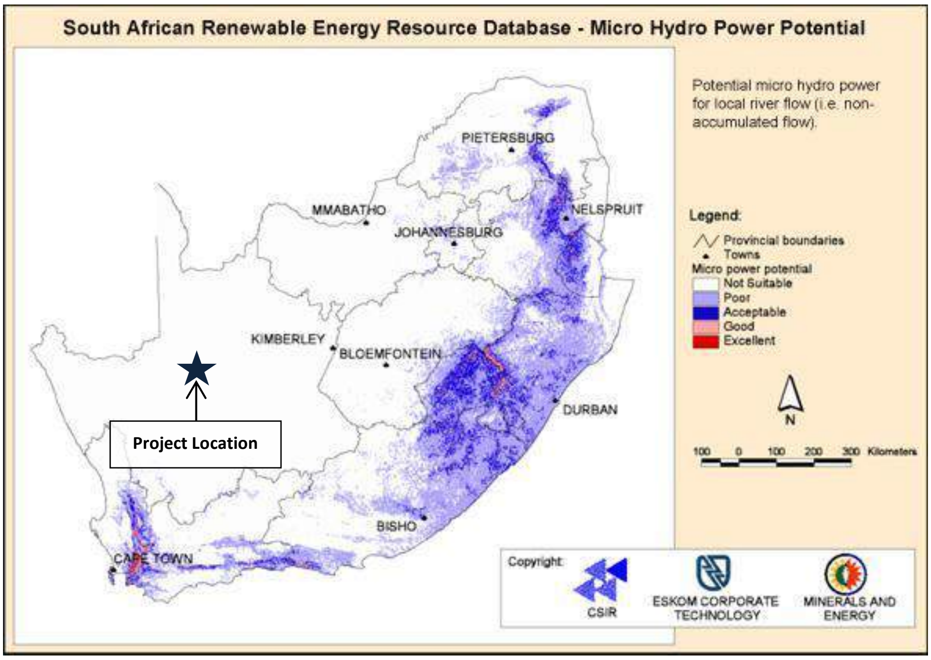

Figure 5.2: Micro Hydro Power Potential (Source: SARERD, 2016)

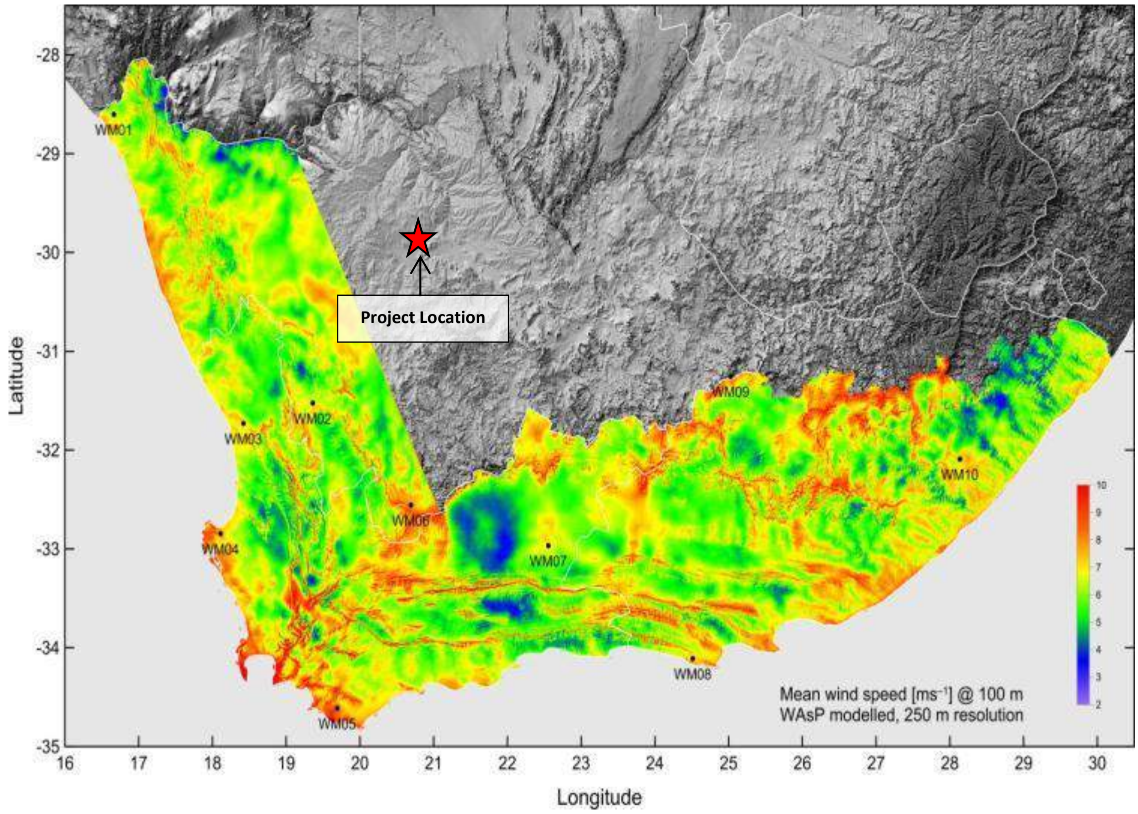

Figure 5.3: Representation of Mean Wind Speed (ms^{-1} at 100 m) (Source: WASA, 2014)

Solar Energy

- *National Level Considerations: Solar Radiation*

The north-western part of South Africa has the highest Global Horizontal Irradiation[1] (GHI), relevant to PV installations (Figure 5.4) and Direct Normal Irradiance[2] (DNI), relevant to CPV and tracking PV installations. 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 solar radiation between 1500 kWh/m^2 and 1700 kWh/m^2 per annum, which is not completely feasible for the proposed projects. On the other hand, the Northern Cape (the area with the predominant pink shading in Figure 5.4) has a solar radiation of 2300 kWh/m^2 per annum, which is the highest level. Various developers have received several approvals for PV facilities on farms in the Northern Cape, which shows and justifies the suitability of this area for this type of development.

[1] Global Horizontal Irradiance is the total amount of shortwave radiation received from above by a surface horizontal to the ground

[2] Direct Normal Irradiance is the amount of solar radiation received per unit area by a surface that is always held perpendicular (or normal) to the rays that come in a straight line from the direction of the sun at its current position in the sky.

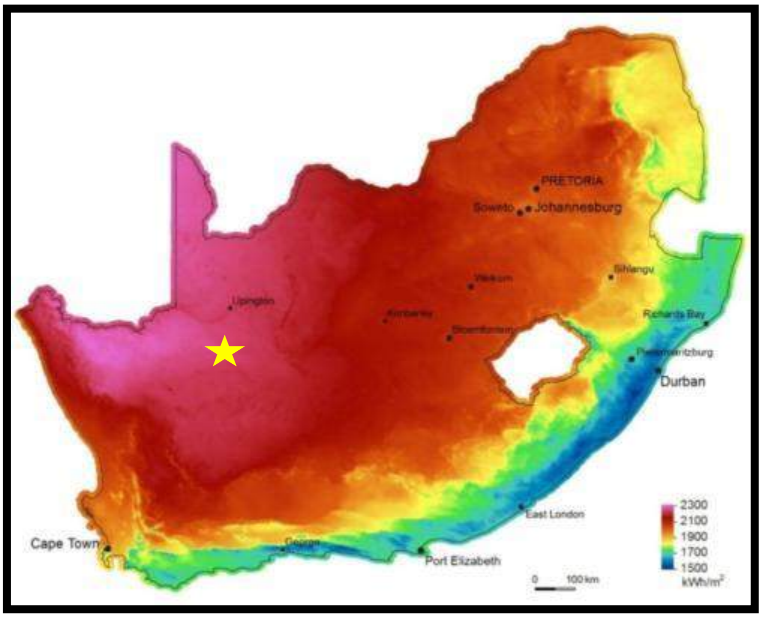

Figure 5.4: Solar Resource Availability in South Africa (Source: SolarGIS map© 2013 GeoModel Solar).

- *REIPPPP and SEA for Wind and Solar PV in South Africa*

The Integrated Resource Plan for South Africa for the period 2010 to 2030 (referred to as "IRP2010") and the IRP Updated Report (2013) proposes to secure 17 800 MW of renewable energy capacity by 2030. The DOE subsequently has 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 REIPPPP 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. As noted in Chapter 1 of this Environmental Impact Assessment Report, the National DEA, in discussion with the DOE, was mandated by MinMec to undertake a SEA[3] to identify the areas in South Africa that are of strategic importance for Wind and Solar PV development. The 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[4]. Following the completion of the SEA, the proposed REDZs, shown in Figure 5.5, were submitted for Cabinet approval for the rollout of solar PV energy in the Northern Cape, Eastern Cape, Western Cape and Free State provinces, including a 30 day public comment period which began in April 2017. Currently, the REDZ are being finalized by Cabinet (including the incorporation of public comment).

[3] Information on this process can be obtained at: http://www.csir.co.za/nationalwindsolarsea/background.html
[4] More information on the SEA can be read at https://redzs.csir.co.za/

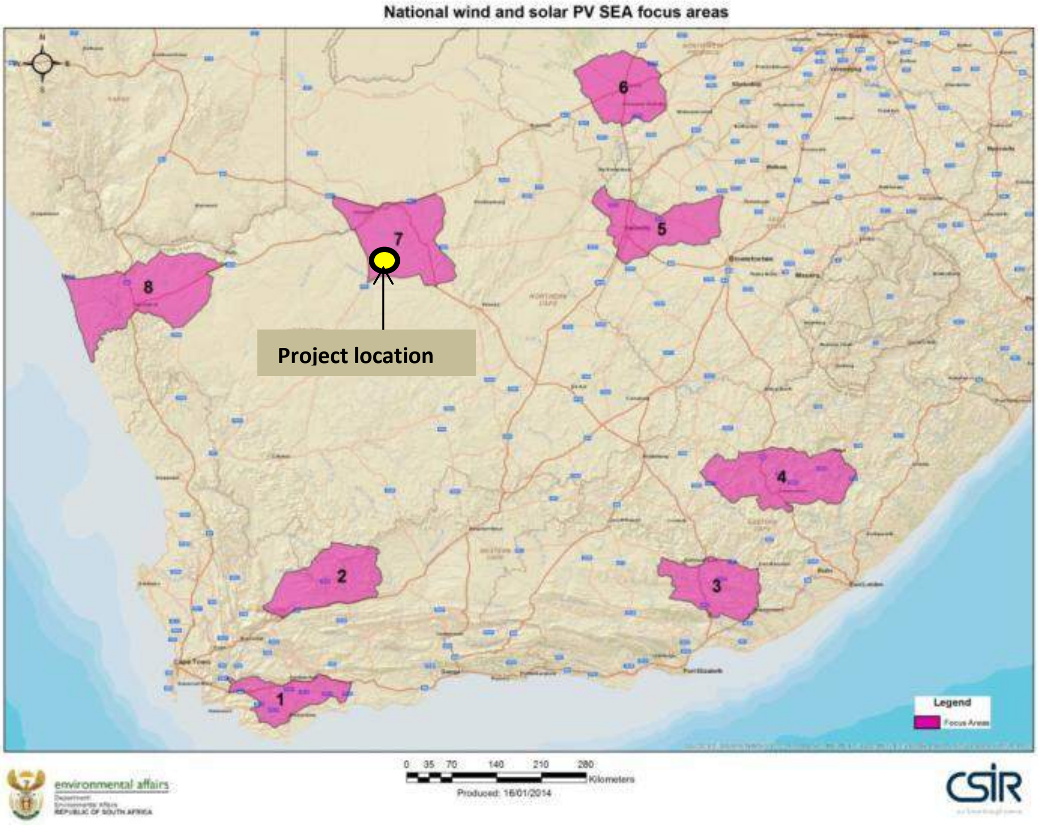

Figure 5.5: Renewable Energy Development Areas identified in the Strategic Environmental Assessment (the proposed juwi project falls within the REDZ 7)

The proposed solar facility **currently falls within the REDZ 7.** The proposed project is therefore in line with the criteria of the SEA and located in an area of strategic importance for Solar PV development. It should be noted that even if a project falls within a REDZ, the proposed development still requires site specific assessments as per the site protocol in order to determine the potential impacts of a project at a local and site specific level. **Therefore, the implementation of a solar energy facility at the proposed project site is more favourable and feasible than other alternative energy facilities.**

Therefore in terms of project and location compatibility, the proposed solar facility is considered to be the most feasible renewable energy land use alternative. Since these alternative land-uses were deemed unsuitable for the area and the preferred and alternative sites, these technologies will not be further assessed during the EIA Phase.

5.1.3. Site Alternatives

As noted above, as per the requirements listed within Appendix 2 (2) (g) (ix) of the 2014 amended EIA Regulations, a site selection matrix should be provided to show how the preferred site was determined through a site selection process. Within this context, it is assumed that the "site" referred to in the 2014 amended EIA Regulations is the farm or land portions on which proposed location alternatives will be considered for the proposed project (discussed in Section 5.1.4 below).

On a site specific 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.

5.1.3.1. Site Specific Considerations

The site selection process took into account the following factors shown in Table 5.1.

Table 5.1: Site selection factors and suitability of the site (Portion 9 of Gemsbok Bult 120)

Factor	Suitability of the Preferred Site
Land Availability	The farm Gemsbok Bult 120, Portion 9, is of a suitable size for the proposed project. The land available to develop at the development footprint of Skeerhok PV 2 extends approximately 400 ha, while only 300 ha will be required for the facility (i.e. Skeerhok PV 2).
Irradiation Levels	2200 - 2300 kWh/m^2/annum (as shown in Figure 5.4)
Distance to the Grid	An Environmental Authorisation for the construction of the 400/132kV Eskom Nieuwehoop Substation was granted to Eskom Holdings SOC Limited on 21 February 2011 by the DEA (Reference Number: 12/12/20/1166). The substation has been constructed. The proposed project is located approximately 17 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 Portion 9 of Gemsbok Bult 120 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.

Given the site selection requirements associated with solar energy facilities and the suitability of the land available on Portion 9 of Gemsbok Bult 120**, no other location or site alternatives have been considered in the EIA Phase.**

5.1.4. Alternative Locations of the Development Footprint

As shown in Figure 5.6 and discussed in Chapter 1 of this Draft EIA Report, the current project proposal is one of three PV projects proposed on site. The proximity of the site location (preferred) for the Skeerhok PV 2 project to the Nieuwehoop Substation (completed) was the main consideration in terms of technical and economic feasibility of where the preferred site is.

The determination of the development footprint within the site was determined through a desktop screening assessment of the site and consultation with the relevant landowner identifying possible areas that should not be proposed for the development (i.e. no-go areas). These have already been excluded from the proposed development footprint shown in Figure 5.6 below. The land available to develop within the development footprint of Skeerhok PV 2 extends approximately 400 ha, while only 300 ha will be required for the facility. The specialist studies (Appendices H to N) have highlighted sensitive features within the original development footprint, and thus the footprint has been adjusted to avoid such features (Please see Chapter 3 for development footprint overlain with environmental sensitivities)

Therefore, no other alternative locations for the Skeerhok PV 2 project are being proposed.

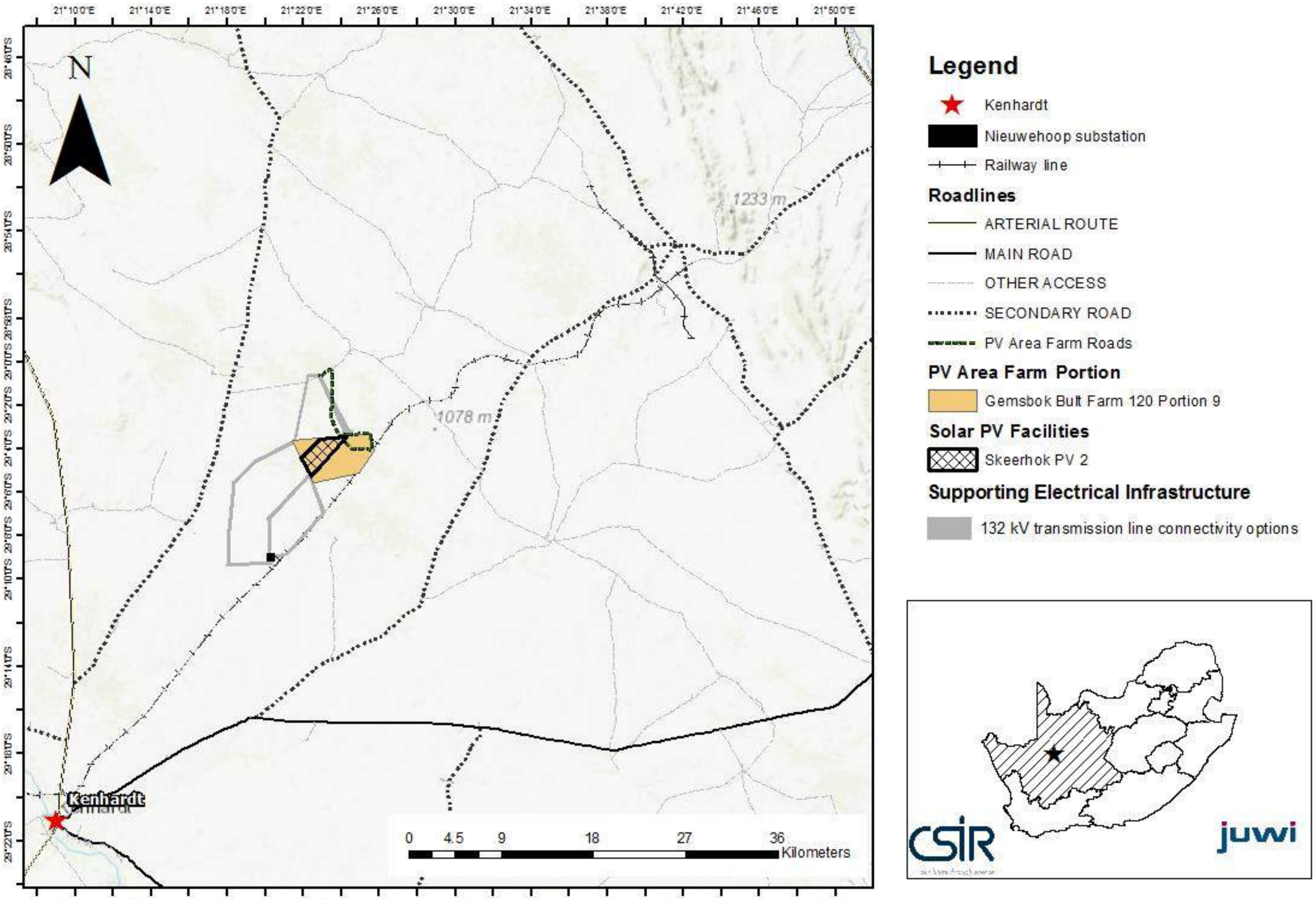

Figure 5.6: Proposed Locality of the proposed Skeerhok PV 2, (including the power line routing, subject to a separate BA process)

5.1.5. Technology Alternatives

5.1.5.1. Solar Panel Types

Only the PV solar panel type will be considered in this EIA, CSP (Concentrated Solar Power) is not considered due to the scarcity of water in the proposed project area and the large volume of water required for CSP, this technology is not deemed feasible or sustainable and will not be considered further. Furthermore, CPV (Concentrated Photovoltaic) technology requires a larger development footprint to obtain the same energy output as PV technology, and it requires active solar tracking to be effective. Additionally, as noted above, in Government Gazette 39111 published on 18 August 2015, no additional procurement target was allocated for CPV.

5.1.5.2. 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;
- Dual axis tracking systems; and
- Fixed Tilt Mounting Structure.

The above mounting systems have been considered in order to inform the detailed design of the proposed solar facility. In a fixed tilt mounting structure, the PV panels are installed at a set tilt facing north and cannot move, whereas in a single axis tracking system the panels follow the sun (i.e. east to west) to ensure increased exposure to sunlight, this functionality comes at a higher monetary cost to that of fixed tilt. In a dual axis tracking system, the PV panels can follow the sun from east to west, as well as follow the suns altitude (which results in an optimal angle of radiation onto the panel (Vermaak, 2014)). Dual axis tracking systems can therefore follow the sun throughout the day both horizontally and vertically, however this functionality comes at even higher monetary cost. The type of mounting system will be confirmed during the detailed engineering phase.

5.1.6. Layout Alternatives

As part of the EIA, a larger 400 ha area was assessed by the specialists and considered during this EIA. The determination of the buildable area for the project is discussed above, as well as in Chapters 1 and 2. The Development Envelope has been determined for the project based on the environmental sensitivities present on the site, which is discussed further in Appendices I to N of this EIA Report. Based on the findings of the specialist studies, an environmental sensitivity map has been produced (and included in Chapter 3 of this EIA Report). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 400 ha buildable area that was assessed. Based on this map, the preferred location for the 300 ha Skeerhok PV 2 facility (i.e. Development Envelope), avoids the sensitive features that were identified by the specialists within the original 400 ha buildable area. Based on the boundaries of the Development Envelope and the constraints of the environmental sensitivities, a site layout has also been preliminary determined for this project (Chapter 1). It is important to note that should the layout change subsequent to the issuing of an EA (should such authorisation be granted), any alternative layout or revisions to the layout occurring within the boundaries of the Development Envelope would not be regarded as a change to the scope of work or the findings of the impact assessments undertaken during the EIA Phase. This is based on the understanding that the specialists have assessed the larger area and have identified sensitivities, which have been avoided in the siting of the proposed infrastructure. The Development Envelope is considered to be a “box” in which the project components can be constructed at whichever location without requiring an additional assessment or change in impact significance. Any changes to the layout within the boundaries of the Development Envelope following the issuing of the EA (should it be granted) will therefore be considered to be non-substantive.

Therefore, the findings of the specialist studies have been used to inform the layout of the proposed facility within the preferred site, Skeerhok PV 2. As noted above, the specialist studies conducted during the EIA Phase have identified the various environmental sensitivities present on site that should be avoided, which were taken into account in the layout of the PV facility.

5.2. Concluding Statement of Preferred Alternatives

As per Appendix 2, Section 2 (xi) of the 2014 amended EIA Regulations, and based on Section 5.1 above, the following alternatives have been taken forward into the EIA Phase:

- **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 Skeerhok PV 2 facility. This alternative would result in no environmental impacts on the site or surrounding local area, as a result of the facility. It is a baseline against which other alternatives have been compared and considered during the EIA Phase.

- **Land Use Alternative:**
  - No other land-use or renewable energy technologies were deemed to be appropriate for the site and therefore these technologies will not be further assessed during the EIA Phase. The implementation of a solar energy facility at the proposed project site is more favourable than other alternative energy facilities (please see reasoning in Section 5.1.2 above)

- **Preferred Site and Development Footprint within the site:**
  - The preferred site for the project is Portion 9 of Gemsbok Bult and the Skeerhok PV 2 site; and
  - The preferred development footprint was determined following the outcome of the impact assessment where sensitive features were identified and defined.

- **Technology Alternatives:**
  - Applicable and relevant technology options are described in Chapter 2 of this EIA report, such as those relating to the mounting system.

- **Layout Alternatives:**
  - Layout alternatives for the project were determined following the input from the various specialists by establishing the Development Envelope The studies identified various environmental sensitivities present on the preferred sites that should be avoided, which have been taken into account during the determination of the final layout of the PV facility, which can be seen in Chapter 2.
  - The use of the existing Transnet Service Road or the unnamed farm road also is also discussed in Chapter 2 of this EIA Report. Both access roads have been considered and included in the

project description. The access road that will be selected during construction is currently being discussed by the Project Applicant and Transnet.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 6:

Impact Assessment

CONTENTS

TABLES

FIGURES

6. IMPACT ASSESSMENT

The issues and impacts presented in this chapter have been identified via the environmental status quo of the receiving environment, a review of environmental impacts from other similar renewable projects and input from the specialists that form part of the project team. The impact assessment methodology undertaken for this EIA is included in Chapter 4 (Section 4.6) of this Draft EIA Report, and summarized below.

The impact assessment methodology has been aligned with the requirements for EIA Reports as stipulated in Appendix 3 (3) (j) of the 2014 EIA Regulations. As per the DEAT Guideline 5: Assessment of Alternatives and Impacts the following methodology is to be applied to the predication and assessment of impacts. Potential impacts should be 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. The DEA has stated that no more than 6 approved facilities in this area (within a 20 km radius) will be awarded preferred bidder status (due to the impact to the SKA). However, this assessment will be based on the precautionary approach i.e. assume that all projects will be developed within the area and therefore assuming worst case scenario.

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

- **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).

- **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).

- **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)).

▪ **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) will be:
  - Yes: High reversibility of impacts (impact is highly reversible at end of project life);
  - Partially: Moderate reversibility of impacts; or
  - No: Impacts are non-reversible (impact is permanent).

▪ **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) will be:
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced);
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable (the affected resource is easy to replace/rehabilitate).

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

▪ **Probability** – The probability of the impact/risk occurring:
  - Very likely;
  - Likely;
  - Unlikely;
  - Very unlikely; and
  - Extremely unlikely.

To determine the significance of the identified impact/risk, the consequence is multiplied by probability. This approach incorporates internationally recognised methods from the IPCC (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity. The significance is then rated qualitatively as follows against a predefined set of criteria (i.e. probability and consequence):

▪ **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:

- Very low = 5;
- Low = 4;
- Moderate = 3;
- High = 2; and
- Very high = 1.

- **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.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low;
  - Medium; or
  - High.

Impacts will then be collated into the EMPr and these will include the following:

- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include 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 will be stated.
- Positive impacts will be identified and augmentation measures will be identified to potentially enhance positive impacts where possible.

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

- Impacts will be evaluated for the construction and operation phases of the development. The assessment of impacts for the decommissioning phase will be 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 will be 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 will, where possible, take 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 will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

6.1. EIA PHASE IMPACT ASSESSMENT

The specialist findings presented in this chapter represents a summary of the detailed and original specialist studies contained in the relevant appendices to this report. The current summary of specialist findings is provided in the interest of brevity and with a view to facilitating public participation; as contemplated in the NEMA principles. The Competent Authority, with its mandate of substantive review of the EIA report, is therefore urged to also read the original specialist studies in the relevant appendices to this report with the aim of discharging its decision-making function. Should any discrepancy occur between this summary, and the relevant detailed specialist study; the detailed specialist study will prevail.

Cumulative impacts have been discussed in each sub-section below for the respective field of study. Figure 6.8 highlights the projects that were considered in the cumulative impact assessments conducted by the specialists (projects within a 20km radius of the proposed Skeerhok Projects).

Note: As the SKA RFI study is not a specialist study as per Appendix 6 of the NEMA EIA regulations (as amended 7 April 2017), but rather a technical report, it is not included in the impact assessment below. The full RFI study and the implications of this proposed project for the SKA is attached as **Appendix P.**

Note: Mitigation and management measures relating to the battery storage activity are described in **Appendix O, Section 8.** As this is not a listed activity as per Chapter 4, this activity has not been included in the impact assessment below. These measures have further been described in the EMPr.

6.1.1. Ecology and Hydrology

6.1.1.1. Findings of the Ecological Assessment

An assessment of the ecology and hydrology on the proposed site was conducted by SDP Ecological (2018) and attached as **Appendix I**. The findings of this study are discussed below.

6.1.1.1.1. Flora

The Skeerhok 2 study site lies to the south of a low elevated ridge which serves to divide the watershed between the more northerly proposed Skeerhok PV1 facility and the two proposed southerly projects, namely Skeerhok PV2 and Skeerhok PV3. Skeerhok PV 2, like the neighbouring PV3 site, lies upon a level and topographically consistent portion of land, with its highest elevation lying to the north of the site. The study site incorporates an area of approximately 5.7km2.

According to Mucina and Rutherford’s veld type classification of 2006, Kenhardt and surrounding regions fall within the Bushmanland Arid Grassland veld type. This veld type is located ostensibly south of the Orange River, but may include a number of smaller habitat forms within its broader extent. The most definitive physical drivers of the Bushmanland Arid Grassland veld type that lies within the study area, are meteorological and will relate to surface and subsurface hydrology . Species were identified and recorded at the points depicted in Figure 6.2.

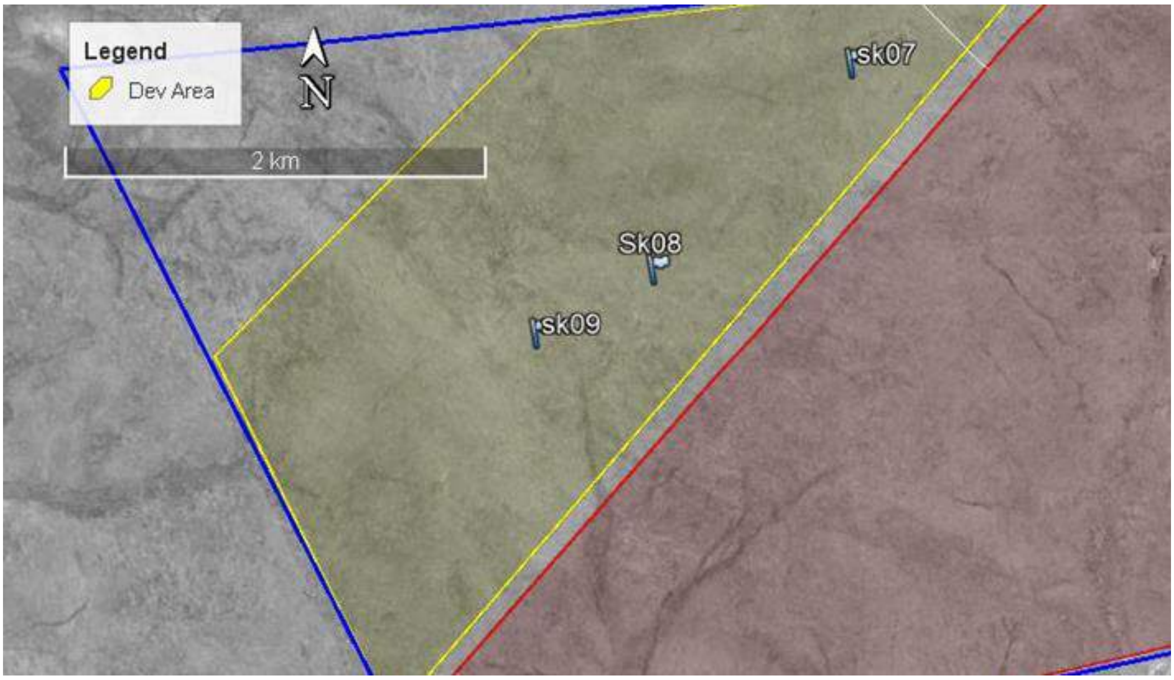

Figure 6.2: Map indicating ecological sample points within Skeerhok PV 2

In general, the area appears to have been subject to low levels of grazing and has maintained a good cover of grasses, typical of this veld type. The dominant graminoid forms on site are *Aristida junctiformis* and *Stipagrostis ciliata.* The prevailing woody species are primarily *Lyceum* and *Acacia spp* providing some species diversity within the grassland environment. Only limited exotic invasion is evident within the site (primarily *Datura ferox*). Specimens such as *Aloe claviflora* may be present on site, however unlike the Skeerhok PV 1 site; no specimens were identified within the subject area. A list of species identified across site is presented in **Table 1 in Appendix I**.

The findings of the study further indicate that there are no specific plant communities across the sample sites, with graminoid species (e.g *Aristida spp*) being evident within most associations. There is however, some indication of associations of more woody species (Acacia spp). This is typical of this grass dominated habitat and supports the contention that the subject site is generally an archetypal example of Bushmanland Arid Grassland with little transformation having been brought about through grazing or other farming activities.

As indicated in the specialist report, there appears to be no significant variation in the distribution of the various vegetation associations across the site. Such results are indicative of the presence of uniform ecological drivers, such as soils, soil depth, elevation and geology, while livestock grazing has probably been maintained at a very low intensity across the site.

6.1.1.1.2. Fauna

A large number of fossorial and burrowing species, including mammals and invertebrates, were identified across the site. Such species included ground squirrel (*Xerus inauris)* and suricates (meerkat) (*Suricata suricata*). Also sporadically present within the site are aardvark (*Orycteropus afer*), as well as the porcupine (*Hystrix africaeaustralis*). 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 site boundaries. In some instances, animal intrusions into the PV facilities may prove to be a "risk" to both the animal and the operations of the facility. The foraging activities of aardvark may serve to expose underground cables, while in one instance the striped mouse (*Rhabdomys pumilio*) was noted to be a problem within PV facilities on account of its propensity to establish nests within cable trays and other small enclosures.

Identified during the site reconnaissance was the Bushmanland tent tortoise (*Psammobates tentorius verroxii*), one of three sub species of tent tortoise within South Africa. This relatively small tortoise is not typical of the "tent tortoise family", in terms of its carapace shape and form. Although listed in the IUCN Red List of Threatened Species as 'least concern", the tortoise is generally sparsely distributed across the desert regions of South Africa. Tortoises are the species of terrestrial fauna most likely to be directly affected by the establishment of PV facilities. The presence of electric fencing may also be lethal to tortoises that directly encounter live wires, as the animal withdraws into its carapace to avoid electrocution. Further mortalities may arise during the construction and operation phases, as a consequence of increased vehicular traffic affecting animals both on roadways that lie outside of the site and within construction areas. Reptiles, smaller vertebrates and other invertebrates are also likely to show varying trends in populations across the subject site.

Table 2 in Appendix I indicates species observed on site or evidence of their presence and includes species that are likely to be encountered in the broader region. The occurrence of such species within the site is likely, in respect of these animals either utilizing the site as refugia, or as part of a wider foraging range or territory.

6.1.1.2. Findings of the Hydrological Assessment

Surface drainage from the Skeerhok PV 2 site is generally dispersive in the form of sheet flow with only minor seasonal dendritic drainage features ("waadhis") being evident in the extreme south of the site. Drainage is in a southerly direction with the primary drainage system being the Rugseersrivier, a seasonal system that discharges into the Haartbees River, near the town of Kenhardt. The catchment of the Rugseerrivier is dissected by a number of roadways and in particular, the main Sishen- Saldanha railway line which effectively bisects the north eastern portion of the catchment (including Skeerhok PV 3) from the southern extent of the catchment and the Rugseerrivier itself. Notably, such infrastructure indicates that the local hydrology of the region has been significantly altered.

Of the three proposed PV sites within the Skeerhok complex, Skeehoek PV 2 lies to the south of a watershed which serves as a divide between the catchments that serve the Brakrivier and Soutrivier to the north, and the Hartbeerivier, to the south. Skeerhok PV 2 drains in its entirety into the Hartbeesrivier catchment, with the most proximal and significant drainage feature being the upper extent of a seasonal drainage line known locally as the Rugsrivieer. This minor drainage feature intrudes into the southern extent of Skeerhok PV 2 (Figure 6.3). Drainage from this points feeds into a semi-natural watercourse located some 4kilometres downstream of PV3 (Figure 6.3). The watercourse at this point can be considered to have arisen primarily through the establishment of the Shishen Saldanha railway line, which has effectively bisected the drainage line and through acting as an attenuating structure, has given rise to this feature. In addition, initiatives to enhance and expand the site to improve the retention of water within the system are also evident. It is clear that some abstraction arises from the system for agricultural or other uses, when water is available.

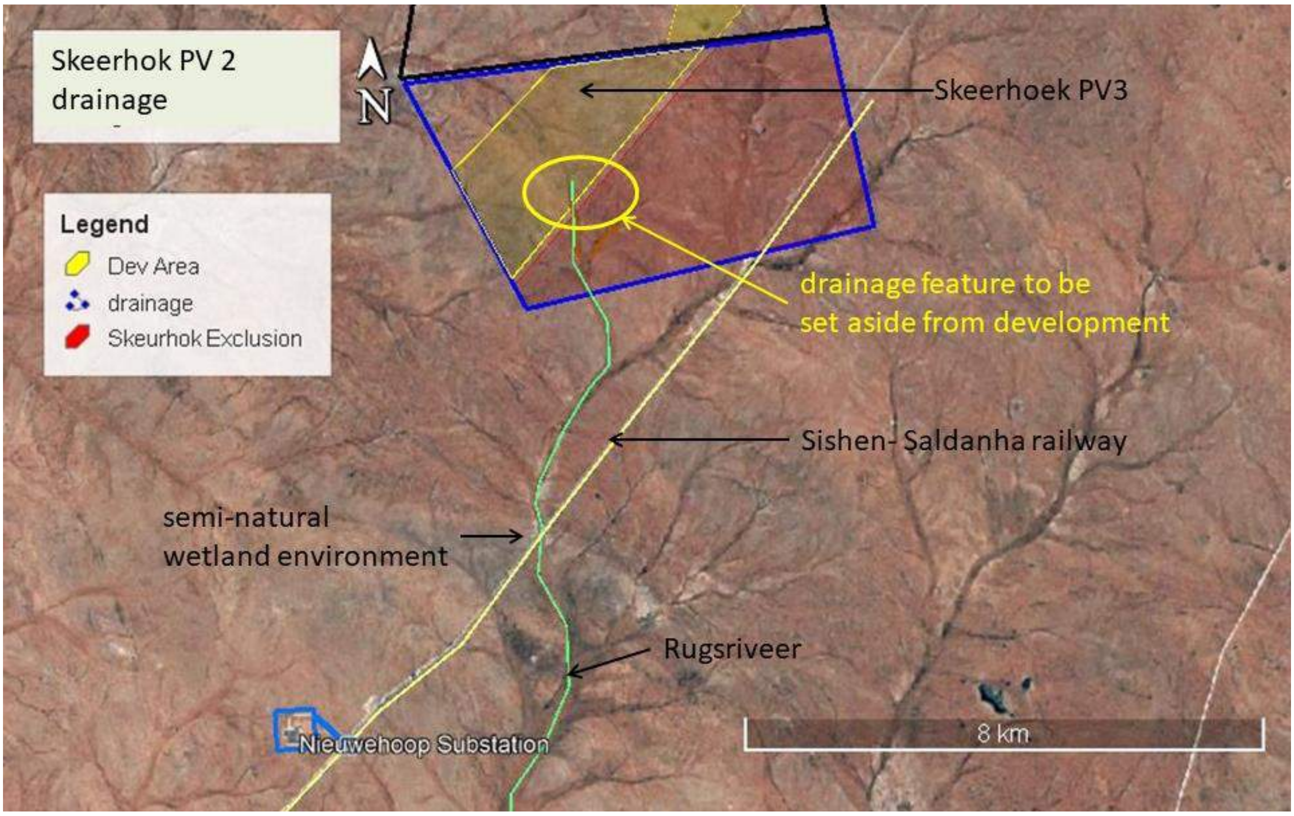

Figure 6.3: Map drainage from Skeerhok PV 2 into the Rugsrivieer system and identifying the semi natural wetland system located next to the Sishen Saldanha railway line.

Given the present state of the system and its apparent value from an agricultural perspective, it is proposed that the identified drainage feature within PV3 be maintained as a point that is unencumbered by development (Figure 6.4). Other drainage features within the site are considered to be of lesser significance primarily on account of their geomorphological character and there is no evidence to support any further points of exclusion within the site on account of hydrological factors.

Some impediments to flow may arise at points around roadways or related infrastructure, however this is of limited consequence. In addition, the presence of the modules across the site, generally serves to alter plant-edaphic relationships through the concentration of water at points and increased shading, leading to improved water retention within soils. This situational change has <u>low level ecological ramifications</u>.

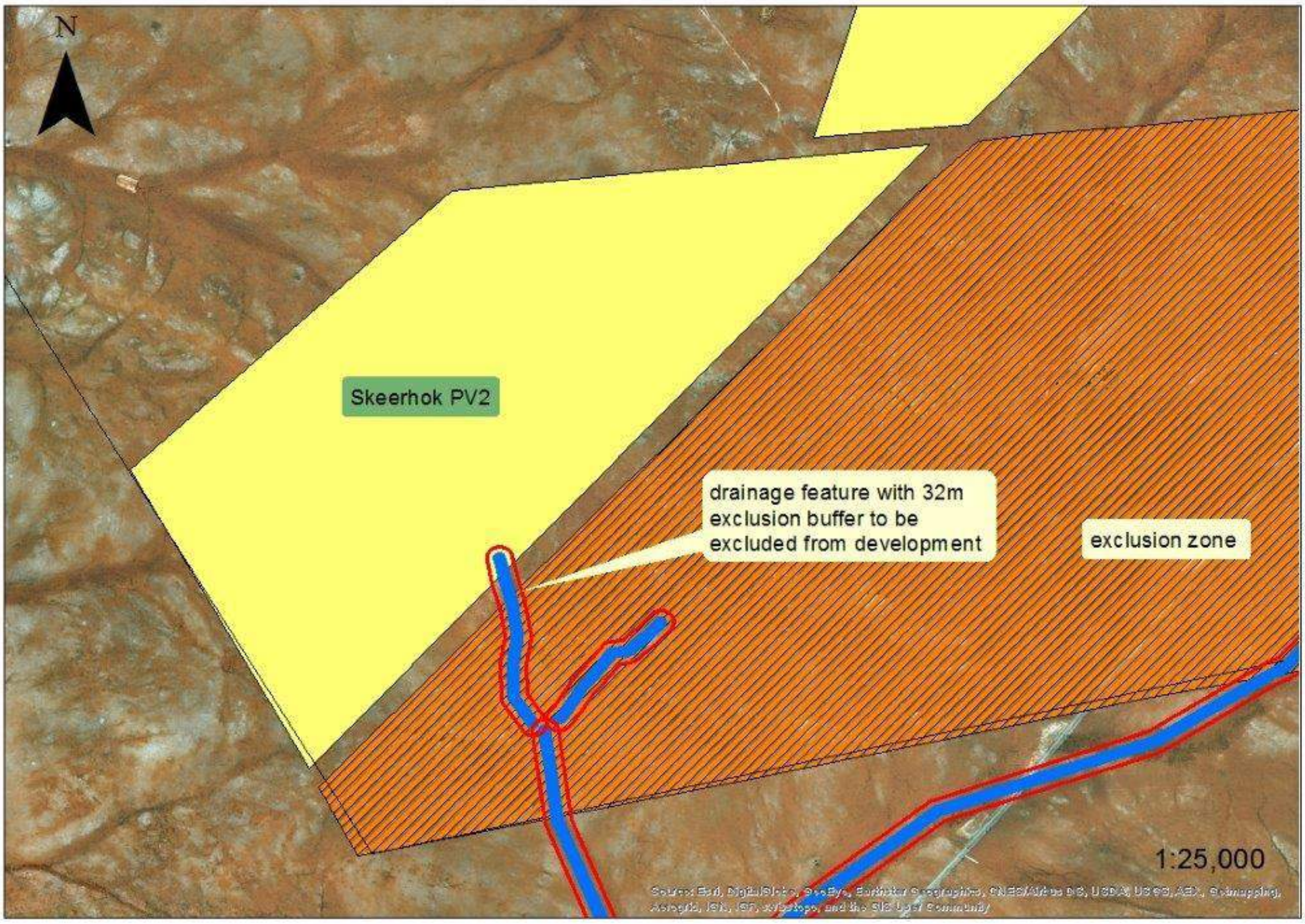

Figure 6.4: Spatial map of Skeerhok 2 showing "exclusion buffer" around the drainage feature.

6.1.1.3. Impact Assessment

Impacts on ecology and hydrology have been described based on the construction, operation and decommissioning phases, as well as the cumulative impacts associated with the proposed project. The proposed development of the PV facility on the study site indicates that the land use change should arise primarily to the south of the site, thus avoiding the drainage features identified to the north. A number of potential impacts have been identified and thoroughly described in **Section 1.5.1 of Appendix I.** These potential negative impacts are summarised below:

Construction Phase

- Alteration of habitat structure and composition;
- Ousting (and recruitment) of various fauna;
- Changes in the geomorphological state of 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 on account of 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

- The "homogenisation of the landscape";
- The increased dissection of habitat;
- The increased presence of exotic and disturbance driven plant species;
- Increased and expanded anthropogenic influences across the region;
- Increased Electrical Light Pollution levels;
- Increased noise pollution levels with concomitant impact on faunal behaviour;

- Vegetation and habitat alteration - change in ecological processes and habitat – reversion to secondary habitat structure at transformed sites;
- Recruitment and behavioural change in fauna - changes in ecological processes and habitat.

The impact assessment for each phase can be seen in the tables below:

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: Without mitigation /management	Significance of impact/risk = consequence x probability: With mitigation /management (residual risk/impact)	Ranking of impact/risk	Confidence level
CONSTRUCTION PHASE DIRECT IMPACTS													
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
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

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)		
Abstraction from subsurface aquifers may have a significant impact on plant water relations.	Water volume and ecological change	Negative	Local	Long term	Moderate	Likely	High	Low	Alternative water resources to be utilized	Very low	Very Low	5	Medium
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

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)		
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 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

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)		
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
CONSTRUCTION PHASE INDIRECT IMPACTS													
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

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)		
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

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)		
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

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)		
Increased Electrical Light Pollution (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
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

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)		
OPERATIONAL PHASE DIRECT IMPACTS													
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	N/A	5	High

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	N/A	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
Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour.	Change in animal behaviour	Negative	Local	Long term	Slight	Unlikely	High	Low	None identified	Very low	N/A	5	Medium

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

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)		
OPERATIONAL PHASE INDIRECT IMPACTS													
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	N/A	5	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)**		
DECOMMISSIONING PHASE DIRECT IMPACTS													
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	Moderate	Very likely	High	Low	Weed control and land management	Moderate	Low	4	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)		
CUMULATIVE IMPACTS													
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

Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Change in drainage patterns and drainage features	Negative	Regional	Long-Term	Substantial	Likely	Low	Moderate	• Exclusion of major drainage lines from development • Avoid sculpting of land • Surface flow energy dissipaters • 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	Moderate	Low	4	High
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	Very 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

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
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

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	Slight	Likely	High	Low	Management of potential sources of electrocution – electric fences	Low	Very low	5	High

6.1.2. *Heritage and Palaentology*

6.1.2.1. *Heritage (including archaeology)*

An assessment of the heritage features of the proposed site was conducted by Jayson Orton (2018) and attached as **Appendix K.** The findings of this study are discussed below.

The primary heritage legislation that needs to be considered is the South African Heritage Resources Act 25 of 1999 and regulations (details at www.sahra.org.za). All heritage material, including burials, is included. Authorisation in terms of the National Heritage Resources Act (NHRA) of 1999 will be required before the development can proceed. Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of S.38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision.

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The site was then subjected to a detailed foot survey during mid-winter. Seasonality in this part of South Africa, where vegetation is minimal at all times of the year, had no material effect on the fieldwork. The Heritage resources found on site are listed in Table 6.1 and visually represented in Figure 6.5.

Table 6.1: List of findings made during the field survey (Appendix K)

Waypoint	Co-ordinates	Site name	Description	Significance (Mitigation)
836	S29 03 32.2 E21 23 54.3	GBB2017/001	Light scatter of MSA and LSA artefacts alongside a pan. Materials include quartzite, quartz, hornfels and CCS. The mid-section of a very thin, flat hornfels blade with unifacial flaking was seen. Variable weathering on the artefacts suggests variable age.	Medium-low (2 hours)
906	S29 03 40.1 E21 23 53.9	---	An isolated lower grindstone on dolerite and found face up alongside a very small pan. The background scatter did not appear to be any different or denser here to elsewhere.	Very low.
837	S29 03 42.1 E21 22 49.9	---	Low density scatter of MSA and LSA artefacts alongside a pan. Materials include quartzite, quartz, silcrete, 'other'. Variable weathering on the artefacts suggests variable age.	Low
838	S29 04 12.2 E21 21 56.6	---	Low density scatter of adiagnostic artefacts alongside a pan. Quartz and quartzite were present.	Very low
839	S29 04 13.2 E21 21 58.5	---	Low density scatter of adiagnostic artefacts alongside a pan. Quartz and quartzite were present.	Very low
840	S29 04 19.2 E21 22 01.4	GBB2017/002	Scatter of LSA and some older artefacts alongside a 'mini-pan'. Materials include quartz, quartzite and CCS.	Medium-low (2 hours)
841	S29 04 12.7 E21 22 17.8	GBB2017/003	A gneiss lower grindstone displaying ephemeral use as well as a low density scatter of quartz	Low

			artefacts. Likely LSA in age.	
842	S29 04 18.6 E21 22 30.5	GBB2017/004	An old and quite extensive quartzite outcrop that has weathered to gravel and small blocks. There are a fair number of quartzite flakes amongst the gravel. It is a greenish-coloured quartzite that I have seen in several places.	Very low
843	S29 04 19.5 E21 22 33.3			
844	S29 04 15.9 E21 22 36.5			

Archaeological resources were found to be very sparsely distributed across the study area with only a few areas found to have artefacts present. None of these was of any significance, since they consisted of either background scatter artefacts or else low density scatters lacking in diagnostic artefacts. There were, however, isolated background scatter artefacts found throughout the study area.

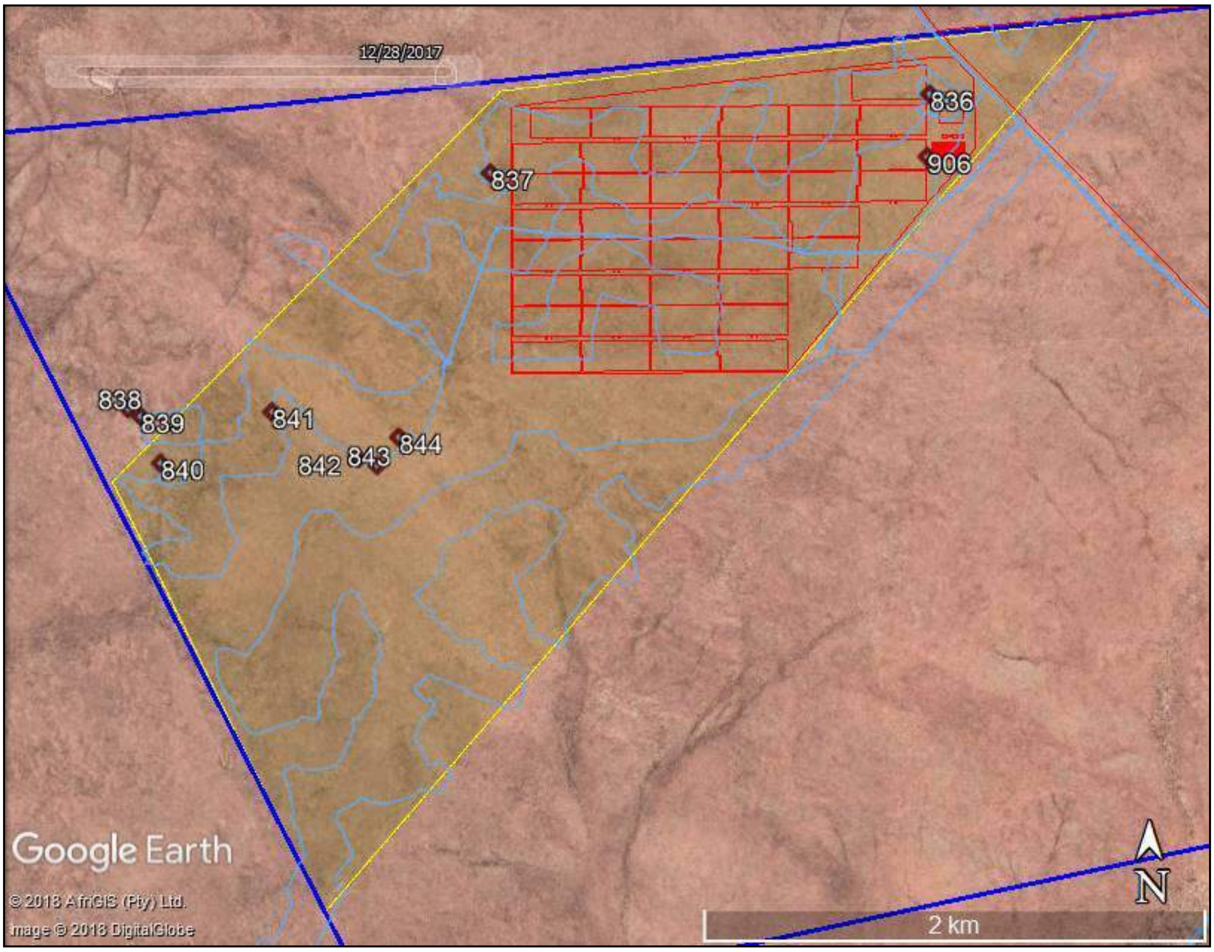

Figure 6.5: Map showing the distribution of heritage resources (numbered symbols) (HIA, Appendix K)

SAHRA requested that the visual impact on heritage resources be considered and thus it is pertinent to note that the only visually sensitive archaeological site known to the author in the broader area is a rock art site located 7.5 km south of the footprint area. This is the site on the boulder depicted in Figure 9 of Appendix K.

The cultural and natural landscape is also of concern. However, the cultural landscape is very poorly developed in this area with fences, water troughs and wind pumps being the primary anthropogenic features. The primary sense of place is one of remoteness rather than of a farming landscape. This remoteness has already been impacted upon by the presence of the railway line, Nieuwehoop Substation and all associated power lines. The natural landscape lacks visually interesting and sensitive features. In addition, the proposed site is a long distance from any important roads (it is 23 km from the R27) and is highly unlikely to be visible to anyone other than local residents making use of the gravel road along the railway line. Solar PV facilities are not very tall and, if an earthy coloured paint is used for the buildings where feasible, they can be almost invisible from as little as 1 km away. A pan 6.5 km northeast of the study area was cultivated during the mid-20th century. This shows the low intensity, opportunistic subsistence agriculture practiced in a pan when sufficient rain had fallen. All other activities in the broader area relate to small stock grazing. It is notable that the landscape in the vicinity of the study area already has an electrical layer comprised of a large substation and several power lines. It is because of the substation that the development location has been chosen.

Although no highly significant sites were located within the proposed development footprint, the chance still exists that one could occur there and be damaged or destroyed by the proposed development. The survey has ensured, however, that no large and potentially highly significant sites would be impacted. Graves could also occur, but again, the chances are small. The chances of impacting on significant palaeontological resources are considered minimal. The single visually sensitive heritage site in the area, a rock art site, is located well far enough away to be of no concern. The only other issue is visual impacts to the cultural landscape but this issue is unavoidable and of little heritage concern.

6.1.2.2. Palaeontology

A desktop assessment of the paleontology of the proposed site was conducted by John Almond (2017) and attached as an annexure in **Appendix K.**

The region is drained by a dendritic network of shallow, southwesterly-flowing tributary streams of the Hartbeesrivier such as the Rugseersrivier and other unnamed drainage lines. The geology of the study area is shown on adjoining 1: 250 000 geology sheets 2920 Kenhardt and 2820 Upington (Council for Geoscience, Pretoria). The entire area is underlain at depth by a variety of Precambrian basement rocks that are *c.* 2 billion years old and are assigned to the **Namaqua-Natal Province**. These ancient igneous and high-grade metamorphic rocks - mainly granites and gneisses of the **Keimoes Suite** (granitoids) *plus* high grade metasediments of the **Jacobmynspan Group** (*e.g.* gneisses of the **Sandnoute Formation**) – are listed in the legend to Figure 1 in Appendix K. The various basement rock units are described in the Kenhardt and Upington 1: 250 000 sheet explanations by Slabbert *et al.* (1999) and Moen (2007) respectively and are placed in the context of the Namaqua-Natal Province by Cornell *et al.* (2006). They generally crop out as scattered, low surface exposures rather than elevated *koppies*. The Precambrian crustal rocks are transected by the NW-SE trending Boven Rugzeer Shear Zone which trends NW-SE to the southwest of the core solar development study area and will be transected by the associated powerline connection to Nieuwehoop Substation. The shear zone is a band of large-scale tectonic deformation which separates two major crustal blocks in Bushmanland known as the Kakamas Terrane and Areachap Terrane.

Table 6.2: Fossil heritage recorded from the major rock units that are represented within the Skeerhok PV Solar Energy Facility 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 (*e.g.* Tertiary alluvium associated with large old river courses)
Basement granites and gneisses NAMAQUA-NATAL PROVINCE	Highly-metamorphosed sediments, intrusive granites PRECAMBRIAN / MID-PROTEROZOIC (*c.*1- 2 billion years old)	ZERO	ZERO

The desktop study showed that the probability of finding and damaging or destroying significant palaeontological material during development is extremely unlikely. As such, the potential impacts to palaeontology are considered to be very low. The only measure that needs to be put in place is to ensure that the environmental control officer is alerted if any fossil material is found and that such material gets reported to SAHRA. A palaeontologist may need to inspect the find or conduct further research. The impact significance after mitigation remains very low.

6.1.2.3. Impact Assessment

In terms of palaeontology, as described above, it is concluded that both the Precambrian bedrocks and the Late Caenozoic superficial sediments underlying the study area are generally of <u>very low palaeontological sensitivity</u>, although isolated and largely unpredictable, pockets of high sensitivity (*e.g.* mammalian remains) may occur sporadically.

Only one significant heritage resource has been identified in the vicinity of the proposed Skeerhok PV1 development. This is an archaeological site associated with a pan that has in the past been excavated deeper to improve its water catchment ability (Figure 6.5 above and Figure 25, Appendix K). Based on both fieldwork and desktop research as well as the concerns of SAHRA, the potential heritage-related impacts identified during the EIA assessment are:

<u>Construction Phase</u>

- Potential direct impacts to archaeological resources;
- Potential direct impact to palaeontological resources;
- Potential direct impacts to graves;

- Potential direct and visual impacts to the cultural landscape;
- Potential visual impacts to all visually sensitive heritage resources.

Operational Phase

- Potential direct and visual impacts to the cultural landscape;
- Potential visual impacts to all visually sensitive heritage resources.

Decommissioning Phase

- Potential direct and visual impacts to the cultural landscape;
- Potential visual impacts to all visually sensitive heritage resources.

Cumulative impacts

- Potential direct impacts to archaeological resources;
- Potential direct impact to palaeontological resources;
- Potential direct impacts to graves;
- Potential direct and visual impacts to the cultural landscape;
- Potential visual impacts to all visually sensitive heritage resources.

The impact assessment table below shows the impact assessment undertaken for palaeontogy, archaeology and heritage for the proposed Skeerhok PV 2 facility for the construction, operation and decommissioning phases.

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 DIRECT IMPACTS													
Clearing of site and excavation of foundations and construction of the facility	Loss of / damage to archaeological sites	Negative	Site	Permanent	Severe	Very unlikely	Non-reversible	High	Final footprint survey, excavation if needed	Low	Very low	5	High
	Loss of / damage to palaeontological materials	Negative	Site	Permanent	Severe	Extremely unlikely	Non-reversible	High	Chance finds procedure	Very low	Very low	5	High
	Loss of / damage to graves	Negative	Site	Permanent	Extreme	Extremely unlikely	Non-reversible	High	Exhumation process	Very low	Very low	5	Medium
	Impacts to the cultural landscape	Negative	Local	Short term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	Minimise footprint, minimise white-painted surfaces	Low	Low	4	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)		
OPERATION PHASE DIRECT IMPACTS													
Presence of the solar energy facility on the landscape and occasional access by maintenance vehicles	Impacts to the cultural landscape	Negative	Local	Long term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	None	Low	Low	4	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)		
DECOMMISSIONING PHASE DIRECT IMPACTS													
Presence of the solar energy facility on the landscape, frequent access by construction vehicles, creation of dust and landscape scarring	Impacts to the cultural landscape	Negative	Local	Short term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	Minimise work time, Use dust suppression measures	Low	Low	4	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)**		
CUMULATIVE IMPACTS													
Clearing of sites, excavation of foundations and construction of the facilities	Loss of / damage to archaeological sites	Negative	Site	Permanent	Severe	Very unlikely	Non-reversible	High	Final footprint survey, excavation if needed	Low	Very low	5	High
	Loss of / damage to palaeontological materials	Negative	Site	Permanent	Severe	Extremely unlikely	Non-reversible	High	Chance finds procedure	Very low	Very low	5	High
	Loss of / damage to graves	Negative	Site	Permanent	Extreme	Extremely unlikely	Non-reversible	High	Exhumation process	Very low	Very low	5	Medium
	Impacts to the cultural landscape	Negative	Local	Short term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	Minimise footprint, minimise white-painted surfaces	Low	Low	4	High

6.1.3. Visual Impact Assessment

6.1.3.1. Findings of the visual impact assessment

The Visual Impact Assessment was conducted by CSIR (2018) and externally reviewed by SiVEST. The results and findings of the study (**Appendix M**) are discussed below.

A desktop study was conducted to establish and describe the landscape character of the receiving environment. A combination of data analysis using GIS and a review of existing literature was used to identify and describe landscape elements and character. Potential areas of scenic interest and sensitive visual receptors were also identified. A Viewshed Analysis was also conducted for the surrounding region of the proposed project area and components of the development relevant to the assessment of the potential visual impact (in a 10 km radius) using ArcMap software.

The landscape is characterised as a semi-desert steppe that is sparsely vegetated by grassland with patchy occurrence of low shrubs. The elevation characteristics of the project area are very slight (ranging from ~ 900 m – 1050 m) with an average of slope of 0.5 %, an elevation gain of approximately 27 m on the north-east profile (across 14 km) and 31 m on the east-west profile (across 6 km).

According to the SPOT Building Count there are several buildings/structures within 10 km of the project area. At this stage, these are assumed to be mostly farmsteads and it is possible that existing views from these buildings/structures may be affected by the proposed juwi Skeerhok PV 2 development.

Potential visual receptors that may be impacted by the proposed juwi Skeerhok PV 2 development that have been identified in this desktop investigation mainly include *(if present):*

- National protected/conservation areas;
- Residents of farms in and around the project area;
- Residents of towns within the vicinity of the project area; and
- Road users of the R27, R383 and other access roads in and around the project area.

Based on the distances of the project area from protected areas, tourist and major access routes, and the town of Kenhardt (Figure 6.6 below) it is unlikely that the views of these potential visual receptors will be significantly adversely affected by the proposed juwi Skeerhok PV 2 development. The greatest risk of visual impact would be to residents of farms in and around the project area. Table 6.3 below describes the potential sensitive visuals receptors and their distance and direction from the proposed juwi Skeerhok PV 2 site.

Table 6.3: Potential visual receptors that may be impacted by the proposed juwi Skeerhok PV development (Appendix M)

Potential sensitive visual receptor	Distance and direction from project area
Residents of farms in and around the project area	17 structures are seemingly present on the proposed project area, with multiple present within 20 km of the project area. Not all of these structures are necessarily occupied. And discrepancies in the SPOT building count data may

	also register farm dams or kraals as buildings.
Motorists on other major access - R383	19 km south
Motorists on tourist routes - R27	20 km west
Residents of towns – Kenhardt	26 km south west
Visitors to and residents/staff of protected/conservation areas	48 km north west (Tierberg Nature Reserve)

The juwi Skeerhok PV 2 development is situated within a Renewable Energy Development Zone (REDZ) – specifically the Upington REDZ - which was investigated as part of the SEA for wind and solar photovoltaic energy in South Africa commissioned by the DEA. The SEA included an assessment of the landscape sensitivities of features within REDZ which considered visual, scenic, aesthetic and amenity value. “Landscape sensitivity was determined as part of this study through the identification of natural, scenic and cultural resources which have aesthetic and economic value to the local community, the region, and society as a whole.”. The landscape/visual sensitivity of the area where the juwi Skeerhok PV development is proposed, has been classified as having a low sensitivity to solar PV development (**Error! Reference source not found.**, Appendix M).

Based on the findings of the VIA, the following impact drivers/pathways may lead to visual intrusion to the views of sensitive visual receptors:

- Clearance of vegetation for solar field, laydown areas, buildings and roads
- Increased traffic
- Night lighting
- Dust
- Veld fires
- Established infrastructure
- Cumulative effects of the abovementioned impact drivers of all proposed solar PV development in the proposed project area

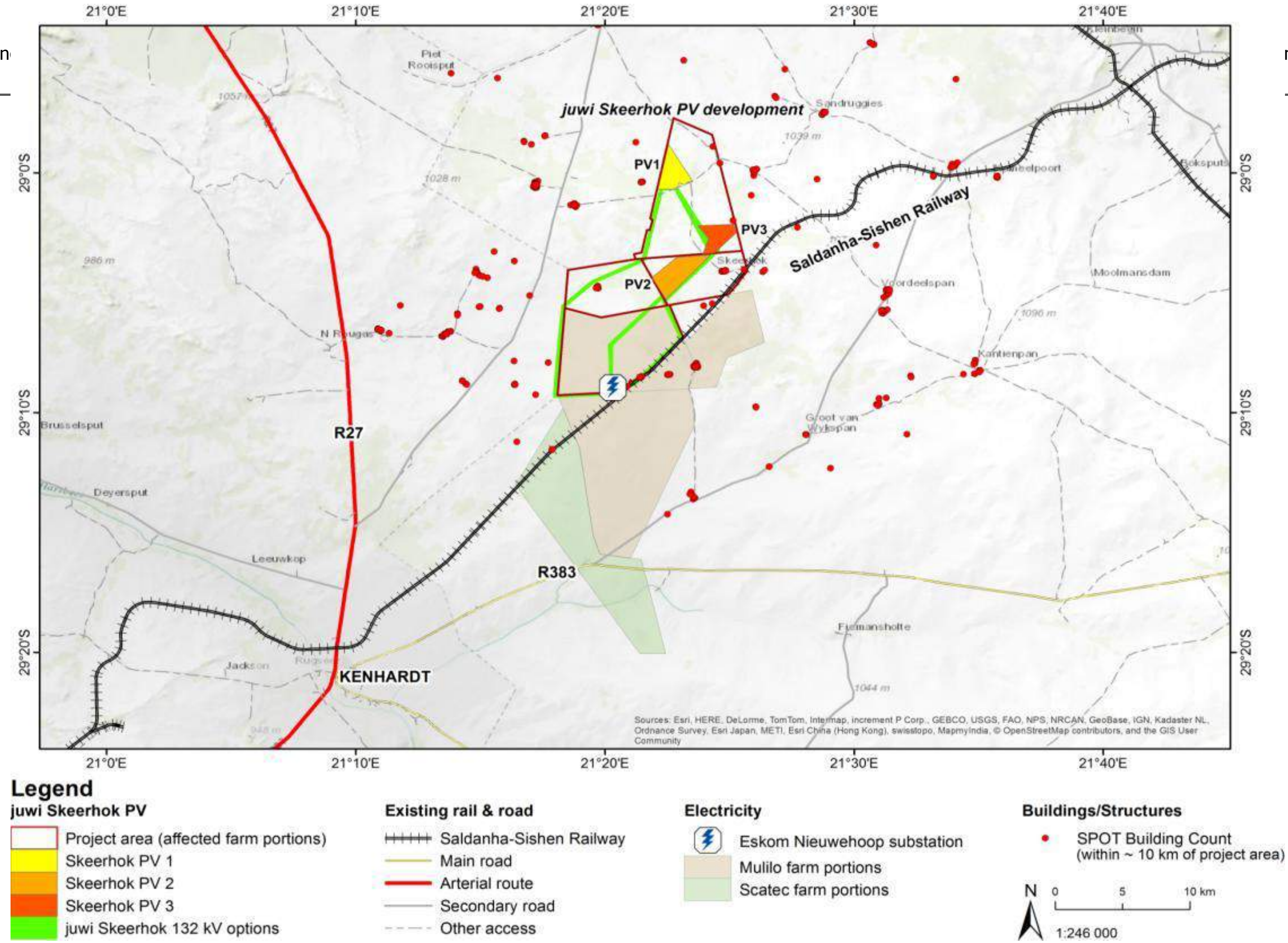

Figure 6.6: Summary of key landscape features and potential sensitive visual receptors in the project area and surrounds.

6.1.3.2. Impact assessment

The changes to the landscape character that may be brought about by the proposed Skeerhok PV 2 development can have impacts on the views of potential sensitive visual receptors. However, the existing approvals for solar PV developments and the construction of high-voltage electricity infrastructure in the direct surroundings of the project area have established a new status quo industrial/electrical landscape character. As such, the potential risks to sensitive visual receptors have been extensively investigated during the EIA processes for the Mulilo and Scatec solar PV developments.

Key impact drivers that may intrude the views of sensitive visual receptors are presented in Table 6.4 below

Table 6.4: Key project aspects may result in impacts to the views of sensitive visual receptors and the associated project phase (Appendix M)

Impact	Impact pathway/driver	Project phase		
		Construction	Operation	Decommissioning
Visual intrusion to the views of sensitive visual receptors	Clearance of vegetation for solar field, laydown areas, buildings and roads	X		X
	Construction/decommissioning activities (all infrastructure, incl. roads, substations and transmission lines)	X		X
	Increased traffic	X	X	X
	Night lighting	X	X	X
	Dust	X		X
	Veld fires	X		X
	Established infrastructure		X	
	Cumulative effects of the abovementioned impact drivers of all proposed solar PV development in the proposed project area	X	X	X

The impact assessment table below shows a detailed VIA as per Appendix M for the construction, operation and decommissioning phases of the proposed project.

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 DIRECT IMPACTS													
Clearance of vegetation for solar field, laydown areas, buildings and roads	Visual intrusion to views sensitive of visual receptors	Negative	Local	Short-term	Substantial	Very Likely	Moderate	Low	- Minimise the footprint of cleared vegetation. - Phased clearance of the area for solar field in order to reduce the amount and duration of bare soil exposure. - Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. - Commence with restoration of disturbed, cleared land as soon as possible. - Maintain rehabilitated surfaces until vegetation is established, sustainable and blends well with surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Control Officer (ECO).	**Moderate**	**Low**	4	High
Increased traffic		Negative	Local	Long-term	Moderate	Likely	High	Low	- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time - Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only	**Moderate**	**Low**	4	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)		
Night lighting		Negative	Regional	Long-term	Moderate	Likely	High	Low	- Develop a lighting plan that: - documents the design, layout and technology used for lighting; - indicates how nightscape impacts will be minimised; - includes a process for quick and effective resolution of lighting complaints; and - Do not exceed the minimum lighting requirement for effective safety and security. - Minimise bright light (uplighting and glare) with appropriate screening. - Reduce light pollution through the use of low-pressure sodium light sources. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Avoid light spilling beyond the project boundary. - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting. - Switch off lights when not in use. -	**Low**	**Very Low**	5	High
Dust		Negative	Local	Short-term	Slight	Very Likely	Very high	Low	- Implement standard construction site dust control methods (i.e. dampening with water) as required.	**Low**	**Very Low**	5	High
Veld fires		Negative	Local	Long-term	Slight	Unlikely	Very high	Low	- Implement fire risk reduction and containment measures, including: - worker awareness; - designated, safe smoking areas; - fire breaks; and - appropriate and working firefighting equipment.	**Low**	**Very Low**	5	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)		
OPERATION PHASE DIRECT IMPACTS													
Increased traffic	visual intrusion to views sensitive of visual receptors	Negative	Local	Long-term	Moderate	Likely	High	Low	- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak. - Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only.	**Moderate**	**Low**	4	High
Night lighting		Negative	Regional	Long-term	Moderate	Likely	High	Low	- Develop a lighting plan that: - documents the design, layout and technology used for lighting; - indicates how nightscape impacts will be minimised; - includes a process for quick and effective resolution of lighting complaints; and - Do not exceed the minimum lighting requirement for effective safety and security. - Minimise bright light (uplighting and glare) with appropriate screening. - Reduce light pollution through the use of low-pressure sodium light sources. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Avoid light spilling beyond the project boundary. - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting. - Switch off lights when not in use.	**Low**	**Very Low**	5	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)		
OPERATION PHASE DIRECT IMPACTS													
Established infrastructure		Negative	Local	Long-term	Moderate	Very Likely	Moderate	Low	- Use appropriate coloured materials for structures to blend in with the backdrop of the area where this is technically feasible and where the colour or paint will not negatively affect the functionality of the structures. - Maintain painted features and repainted when colours fade or paint flakes. - Choose materials, coatings and paints with minimum reflectivity where possible. - Paint grouped structures the same colour to reduce colour contrast. - Construct powerline towers to be similar to those already existing in the landscape, where possible.	**Moderate**	**Moderate**	4	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)		
DECOMMISSIONING PHASE DIRECT IMPACTS													
Clearance of vegetation for solar field, laydown areas, buildings and roads	Visual intrusion to views sensitive of visual receptors	Negative	Local	Short-term	Substantial	Very Likely	Moderate	Low	- Minimise the footprint of cleared vegetation. - Phased clearance of the area for solar field in order to reduce the amount and duration of bare soil exposure. - Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. - Commence with restoration of disturbed, cleared land as soon as possible. - Maintain rehabilitated surfaces until vegetation is established, sustainable and blends well with surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Control Officer (ECO).	**Moderate**	**Low**	4	High
Increased traffic		Negative	Local	Long-term	Moderate	Likely	High	Low	- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time. - Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only	**Moderate**	**Low**	4	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)		
DECOMMISSIONING PHASE DIRECT IMPACTS													
Night lighting		Negative	Regional	Long-term	Moderate	Likely	High	Low	- Develop a lighting plan that: - documents the design, layout and technology used for lighting; - indicates how nightscape impacts will be minimised; - includes a process for quick and effective resolution of lighting complaints; and - Do not exceed the minimum lighting requirement for effective safety and security. - Minimise bright light (uplighting and glare) with appropriate screening. - Reduce light pollution through the use of low-pressure sodium light sources. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Avoid light spilling beyond the project boundary. - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting. - Switch off lights when not in use.	**Low**	**Very Low**	5	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)		
DECOMMISSIONING PHASE DIRECT IMPACTS													
Dust		Negative	Local	Short-term	Slight	Very Likely	Very high	Low	- Implement standard construction site dust control methods (i.e. dampening with water) as required.	**Low**	**Very Low**	5	High
Veld fires		Negative	Local	Long-term	Slight	Unlikely	Very high	Low	- Implement fire risk reduction and containment measures, including: - worker awareness; - designated, safe smoking areas; - fire breaks; and - appropriate and working firefighting equipment.	**Low**	**Very Low**	5	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)		
CUMULATIVE IMPACTS													
Cumulative Impacts	Visual intrusion to views sensitive of visual receptors	Neutral	Regional	Long-term	Moderate	Very Likely	High	Low	➢ Adequate implementation of proposed mitigation measures and best practice to reduce visual impacts by all solar PV facilities in the vicinity.	**Moderate**	**Moderate**	4	High

6.1.4. Avifauna (birds)

6.1.4.1. Findings of the bird impact assessment

The bird assessment was conducted by Mr. Jon Smallie (2017) to evaluate the impact on birds from the proposed Skeerhok PV1 facility. This report is attached as **Appendix J.**

This arid area is home to several large terrestrial bird and raptor species, the most important of which are Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori*, Secretarybird *Sagittarius serpentarius*, Karoo Korhaan *Eupodotis vigorsii,* Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus*. In addition to being classified as threatened regionally and in some cases globally, most of these species are facing significant threats to their survival from existing impacts in the arid parts of South Africa. In addition, this area is home to an assemblage of arid zone adapted smaller bird species including larks, sparrow-larks, chats and others. Most important of these from a conservation perspective are Red Lark *Calendulauda burra* and Sclater's Lark *Spizocorys sclateri*, both of which are listed as regionally threatened species (Vulnerable and Near-threatened respectively), have very restricted ranges and have been recorded in the broader area within which the study area is situated. Stark's Lark *Spizocorys starki* is also an important endemic present in the area, and Burchell's Courser *Cursorius rufus* (Vulnerable) is a nomadic species which occurs in the broader area.

For the purposes of the bird study (Appendix J) two specialist site visits and three seasons of on-site bird monitoring was conducted, in accordance with the best practice guidelines. The proposed project falls under Regime 2 on account of being of 'medium' avifaunal sensitivity and greater than 150ha in extent. This means it requires two to three site visits of 3 to 5 days duration each over 6 months. <u>3 x 4 day site visits were conducted thereby slightly exceeding the minimum requirements</u>. The following findings were made with respect to avifauna[1]:

- The surveys on site took place in a slightly above average rainfall year (165.0mm in 2017 c.f. 147.8mm p.a. mean since 1960). This resulted in the data being representative of typical conditions on site.
- The proposed Skeerhok PV 2 site is already relatively impacted by linear infrastructure including roads, railway line, and transmission and distribution power lines.
- There are no Important Bird & Biodiversity Areas close to the proposed site.

<u>Key sightings:</u>

- Walked transects on site recorded 29 small passerine bird species in total. Twenty of these species are either endemic or near endemic to southern Africa, which is a very high level of endemism. Whilst the most abundant species on site were all common species, and important endemic, Stark's Lark *Spizocorys starki* was also recorded in relatively high abundance on site. No regionally Red Listed species were recorded on site by this method.
- Driven transects on site recorded 6 priority species. Two were small passerines, Red Lark *Certhilauda burra* (Vulnerable -1 individual), and Double-banded Courser *Rhinoptilus africanus*. The 4 remaining species were: Kori Bustard *Ardeotis kori* (Near-threatened), Ludwig's Bustard *Neotis*

[1] Full species lists and a greater explanation of each finding can be found in Appendix J

ludwigii (Endangered), and Northern Black Korhaan *Afrotis afraoides*. Three of these species are regionally Red Listed as indicated above. These are graphically depicted in Figure 6.7 below.

- Martial Eagle *Polemaetus bellicosus* (Endangered) was recorded several times off site, approximately 9km to the west. Although these birds are suspected to breed somewhere in that area (no nest was located) this is too far from the proposed site to be of concern.
- A total of 57 bird species were recorded on site during the monitoring programme by all methods and incidentally. Thirty of these are endemic or near-endemic. This included 5 regionally Red Listed species, the 4 mentioned above already and Karoo Korhaan *Eupodotis vigorsii* (Near-threatened). Sclater's Lark *Spizocorys sclateri* and Burchell's Courser *Cursorius rufus* were not recorded on site during this programme, but are considered likely to visit the site occasionally when conditions are right (see Appendix J for species list).
- Considering the bird and habitat data collected on site it is concluded that the following species will be most at risk if the proposed development goes ahead:
    - Ludwig's Bustard;
    - Kori Bustard;
    - Karoo Korhaan;
    - Red Lark;
    - Sclater's Lark; and
    - Stark's Lark.

There are many more endemic but not Red Listed species which will also be of concern, however, the specialist deemed the above suite of species a good surrogate for those more common species in terms of impact assessment and management.

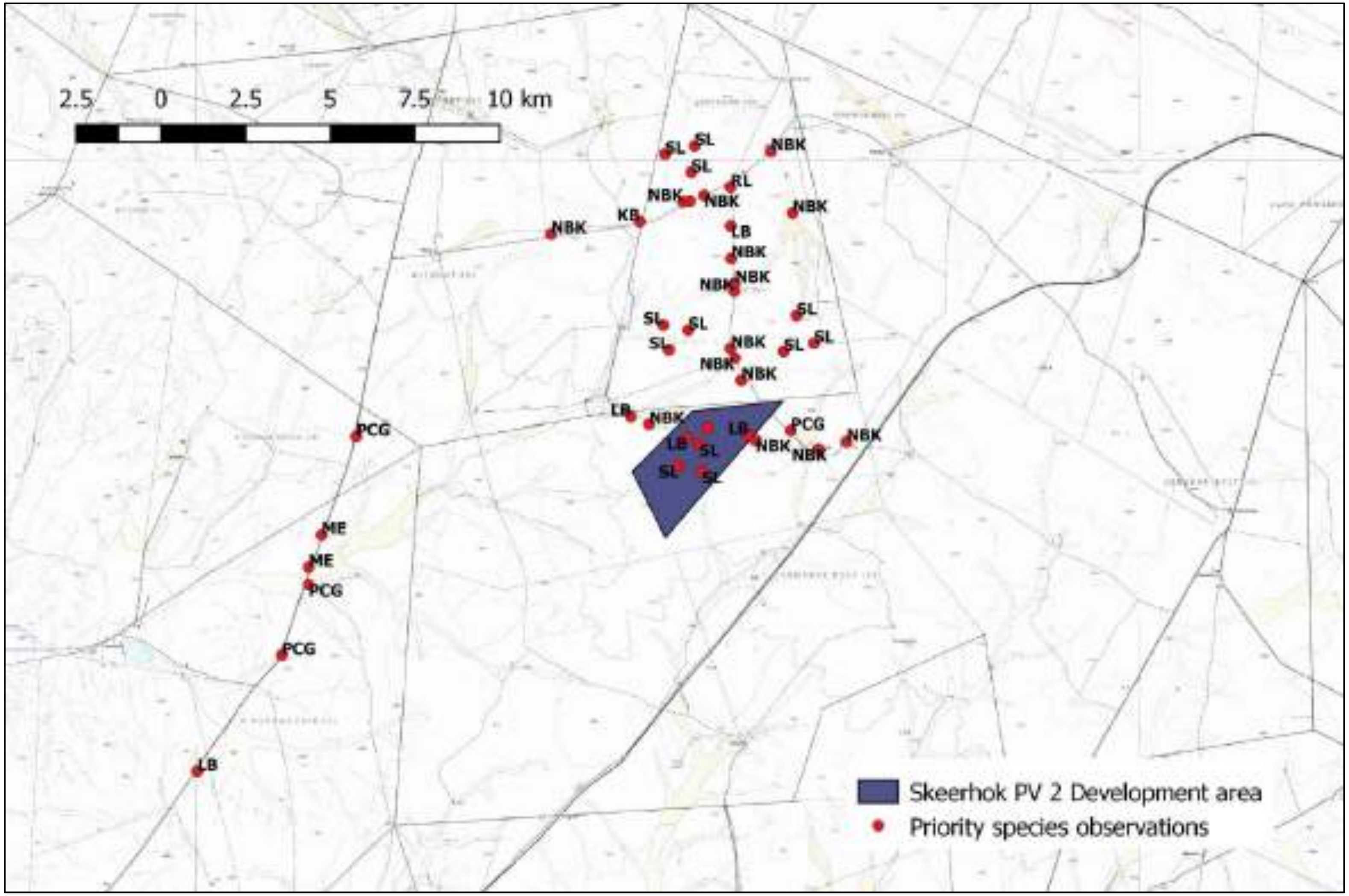

Figure 6.7: Location of all priority species records across all monitoring methods. LB – Ludwig's Bustard; PCG - Pale Chanting Goshawk; ME – Martial Eagle; NBK – Northern Black Korhaan; KB – Kori Bustard; SL – Stark's Lark (Appendix J)

6.1.4.2. Impact assessment

The effects of any development on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and diversity of birds present. A summary of the assessment of the significance of the impacts on avifauna on site is as follows:

- Habitat destruction during the construction phase will be of HIGH significance, mitigated to MODERATE significance.
- Disturbance of birds during the construction phase will be of LOW significance.
- Bird fatalities at the facility during the operational phase (mostly through collision with infrastructure) will be of MODERATE significance, mitigated to LOW.
- Nesting of birds on the facility infrastructure during the operational phase will be of LOW significance.
- Altered surface water runoff on site during the operational phase will be of LOW significance.
- Chemical pollution due to panel cleaning during the operational phase will be of LOW significance.
- Disturbance of birds during the construction phase will be of LOW significance.

In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst case scenario of up to 14 solar facilities being constructed in this 20km radius. However, if as per the DEA statement, only 6 are built, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.

The table below describes the various potential impacts that could occur as a result of the proposed facility for the construction, operational and decommissioning phases as well as 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: Without mitigation /management	Significance of impact/risk = consequence x probability: With mitigation /management (residual risk/impact)	Ranking of impact/risk	Confidence level
CONSTRUCTION PHASE IMPACTS													
Clearing of vegetation	Habitat loss/alteration	Negative	Site	Permanent	Substantial	Definite	Low	Moderate	- Water courses, drainage lines, streams and wetlands should be avoided and a no go buffer of 100m be applied around them. - Dams and livestock water points should likewise be avoided with a 100m no go buffer. - Rocky outcrops should be avoided with a 100m no go buffer. - All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted. - Care should be taken not to introduce or propagate alien plant species/weeds during construction.	High	Moderate	1	High
General construction activities	Disturbance	Negative	Local	Short term	Moderate	Probable	High	Moderate	- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed. - Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.	Low	Low	2	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)		
OPERATION PHASE IMPACTS													
Operation of facility	Bird fatalities	Negative	Site	Long term	Moderate	Probable	High	Moderate	- The more sensitive habitat areas of the site should be avoided. A buffer area has been identified around all farm dams (of 100m) within which no PV panels or other above ground infrastructure should be built. - The PV panels should spend as little time as possible time in a vertical position since this presents a greater collision hazard. - Post construction monitoring programme is recommended for this site - Mitigation must be applied reactively once the facility is operational, only if a significant problem is detected. - Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.	Moderate	Low	1	Low

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)		
OPERATION PHASE IMPACTS													
Operation of facility	Nesting of birds	Positive	Site	Long term	Slight	Probable	High	Low	- None required for the impact of the facility on birds. For the impact of the birds nesting on the facility, we recommend nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation. - We recommend that the operational phase EMP include provision for application to the provincial authority for permits for any necessary nest management.	Low	Low	3	High
Operation of facility	Altered water runoff	Negative	Local	Long term	Slight	Probable	High	Low	- This will need to be managed through the development of a carefully considered surface water/drainage management plan for the site.	Low	Low	2	Low
Operation of facility	Chemical pollution	Negative	Local	Long term	Slight	Probable	High	Low	- The surface water management plan should stipulate the use of environmentally friendly and acceptable cleaning products.	Low	Low	4	Low

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)		
DECOMMISSIONING PHASE IMPACTS													
Decommissioning activities	Disturbance	Negative	Local	Short term	Moderate	Probable	High	Moderate	- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed. - Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.	Low	Low	1	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													
Cumulative displacement of species as a result of habitat loss or transformation	Habitat loss and disturbance	Negative	Regional	Permanent	Substantial	Definite	Low	Moderate	- See section 3.7 in Appendix J for detailed explanation and recommendations.	High	Moderate	1	High

6.1.5. Traffic (Impact Statement)

The purpose of the Traffic Impact Statement (Appendix N2) was to investigate the traffic impact of the proposed development on the surrounding road network and to propose mitigating measures if required. The impact statement has been compiled by the CSIR using existing information and reviewed by Mr. Christo Bredenhann Pr. Eng, a qualified Traffic and Transportation Engineer. The studies used as a reference for this impact statement are listed in Section 7 of Appendix N.

During all phases (construction, operation and decommissioning) of the project, additional traffic will be generated. The highest traffic volumes will be created during the construction phase. This includes activities associated with:

- Site preparation and transporting the construction materials and associated infrastructure to the site; and
- Transportation of employees to and from the site on a daily basis.

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 a 6 m wide surfaced road with 1 lane per direction and unsurfaced shoulders. It has 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. It is currently proposed that existing roads will be used as far as possible, to avoid the construction of new roads for the proposed Skeerhok PV 2 facility.

The traffic generation estimates were based on similar studies conducted within the study area. The estimated traffic generated includes the Scatec Kenhardt project and the Skeerhok PV 1, 2 and 3 projects. The generated traffic for the Skeerhok PV 2 project is anticipated to be similar to the Scatec Kenhardt projects.

For the construction, operational and decommissioning phases, the load estimations were regarded as negligible traffic (Section 4.2, Appendix N2). It is also further emphasized that a full Traffic Impact Assessments (TIA) are normally only required for developments that will generate more than 50 vehicle trips (In + Out) during any peak hour.

6.1.5.1 Impact Assessment

Historic traffic volume figures are not available within the study area; however, the resultant traffic volumes has been assumed to be below the allowed maximum average daily traffic limit of 1000 veh/day. Although the proposed development is expected to generate trips during the construction, operation and decommissioning phases, the traffic generated will be low, based on similar studies conducted within the study area.

The traffic impacts that are likely to 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 amount of traffic will be generated by the proposed facility.

As per the impacts table below, the impacts identified and assessed as part of the reference studies are:

- Increase in traffic generation.
- Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.
- Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment.
- Decrease in quality of surface condition of the roads.
- Cumulative impact of traffic generation of all six projects in the area, including Skeerhok 1 to 3. The cumulative impact during the construction and decommissioning phases of all 6 projects cannot be assessed, as it is unlikely that all projects will be constructed or decommissioned over the same periods (see Table 1.2 in Appendix N2 for the cumulative daily traffic generation estimates).

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 DECOMMISSIONING PHASE IMPACTS													
Traffic generation	Increase in traffic	Negative	Regional	Short term	Moderate	Very likely	Yes	Replace-able	• A permit should be obtained from the PGNC Department of Public Works, Roads and Transport for any abnormal loads transported. • Provide a Transport Traffic Plan to SANRAL and the PGNC Department of Public Works, Roads and Transport. • Road and safety standards should be adhered to.	Low	Low	4	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Short term	Moderate	Likely	No	High Irreplaceability	• 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 signage at access to site at R27 and Transnet Service Road intersection.	High	Moderate	3	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)		
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Negative	Local	Medium term	Moderate	Likely	Yes	Replace-able	• Implement management strategies for dust generation e.g. apply dust suppressant on 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 adhere to vehicle safety standards implemented by the Project Developer. • Avoid using old and noisy construction equipment and ensure equipment is well maintained.	Moderate	Low	4	Medium
Traffic generation	Change in quality of surface condition of the roads	Negative	Local	Short 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; • A Road Maintenance Plan should be developed for the section of the Transnet Service Road that will be used to addresses the following: o Grading requirements; o Dust suppressant requirements; o Drainage requirements; o Signage; and o Speed limits.	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)		
OPERATIONAL PHASE IMPACTS													
Traffic generation	Increase in traffic	Negative	Regional	Long term	Slight	Very likely	High	Replace-able	• Adhere to requirements made within Transport Traffic Plan; • Limit access to the site to personnel; • Increase traffic will be negligible.	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Moderate	Likely	No	High irreplaceability	• 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 signage at access to site at R27 and Transnet Service Road intersection.	High	Moderate	3	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)		
OPERATIONAL PHASE IMPACTS													
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Negative	Local	Medium term	Moderate	Likely	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
	Change in quality of surface condition of the roads	Negative	Local	Long term	Slight	Likely	Yes	Replace-able	• Implement requirements of the Road Maintenance Plan.	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													
Traffic generation	Increase in traffic	Negative	Regional	Long term	Slight	Very likely	High	Replace-able	• Adhere to requirements made within Transport Traffic Plan; • Limit access to the site to personnel; • Increase traffic will be negligible.	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Moderate	Likely	No	High irreplaceability	• 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. • Due to negligible traffic increases, increase in accidents is minimal.	Moderate	Low	3	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													
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Negative	Local	Medium term	Moderate	Likely	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

6.1.6 Social (Impact Statement)

The purpose of the Social Impact Statement (**Appendix N3**) was to review the existing information contained in the reference studies that were conducted for Solar PV developments in the Kenhardt area (see reference list in Section 7, Appendix N). The Social Impact Statement as compiled by the CSIR and externally reviewed by Applied Science Associated (Pty) Ltd (2018). The SIAs used as reference for the statement consulted secondary data sources (published documentation) to obtain basic socio-economic baseline demographics. This secondary data was then augmented with primary data generated by a site visit to the proposed project site as well as the town of Kenhardt.

The major social challenges faced in the Kai !Garib Municipal area include:

- Increases in drug abuse;
- Increases in children under 10 years abusing alcohol;
- Increases in teenage pregnancies;
- Increased crime linked to alcohol and drug abuse;
- High youth unemployment rates; and
- Increased prevalence of HIV & AIDS.

The Kenhardt community appears to have acceptable access to both Human and Social capital. Informants reported that community members are generally in very good health and that most young adults have a secondary education. The high level of unemployment and the increasing number of teenage pregnancies present in Kenhardt requires robust social capital to prevent affected community members from falling into abject poverty. The relative success of the local community in preventing this, suggests that access to social capital is satisfactory.

Access to physical capital in Kenhardt seems average to low. The community has access to bulk services (water, electricity and waste collection), and a range of housing types ranging from formal to informal. Transport is not a significant factor within Kenhardt, due to its very small size; however, access to other urban areas (e.g. Keimoes, Kakemas and Upington) is limited to private transport. Informants also indicated that access to information and awareness of basic rights and public services are very low. Natural capital in Kenhardt is limited due to the harsh climatic conditions and general lack of irrigation water. As a result, community members appear to have limited access to productive natural assets. Finally, access to financial capital is very limited as the bulk of the vulnerable section of the Kenhardt community seems to be dependent on government subsidies and pensions.

6.1.6.1 Impact Assessment

By far the most significant driver of change likely to result from the proposed project is the influx of job seekers into the Skeerhok PV 2 study area, and the corresponding increase in spending and employment. Such an influx of "strangers" into the receiving environment is likely to cause a disturbance in the order of the existing social structure and might also lead to increases in social deviance. Increased spending and employment (even though such employment might be short-term) generates positive impacts through the multiplier effect and by providing much needed financial relief in the area. However, it also creates significant, and often unrealistic, expectations regarding potential employment. The table below summarizes the impacts from each phase that are anticipated or expected to occur due to the proposed Skeerhok PV 2 Project.

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 OPERATION PHASE IMPACTS													
Influx of job seekers into the Kenhardt area	Disruption of existing social structures	Negative	Local	Medium to Long-term	Substantial	Likely	Low	Moderate	• Develop and implement a Workforce Recruitment Plan • Reserve employment, where practical, for local residents • Clearly define and agree upon the PAP • Develop a database of PAP and their relevant skills and experience • Develop and implement a Stakeholder Engagement Plan	Moderate	Low	4	Medium
Outsiders moves into the Kenhardt area	Increases in social deviance	Negative	Local	Medium-term	Substantial	Likely	Low	Moderate	• Develop and implement a Workforce Recruitment Plan • Reserve employment, where practical, for local residents • Clearly define and agree upon the PAP • Develop a database of PAP and their relevant skills and experience • Develop and implement a Stakeholder Engagement Plan • Delivery on the Economic development Plan must be contractually binding on the proponent	Moderate	Low	4	Medium
Expectations created regarding possible employment	Increased frustration in the local community	Negative	Local	Short-term	Moderate	Likely	High	Moderate to low	• Develop and implement the Stakeholder Engagement Plan	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)		
Local spending	Socio-economic benefits as a result of the multiplier effect	Positive	Local	Medium to long-term	Moderate	Likely	n/a	n/a	• Procure goods and services, where practical, within the study area • Obtain regularly required goods and services from as large a selection of local service providers as possible	Low	Low	4	Medium
Local employment	Socio-economic benefits	Positive	Local	Long-term	Substantial	Very likely	n/a	n/a	• Develop and implement a Workforce Recruitment Policy	Moderate	Moderate	3	High
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

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)		
DECOMMISSIONING PHASE IMPACTS													
Decommissioning of the proposed development	Job losses	Negative	Local	Long-term	Substantial	Very likely	Moderate	Moderate	• The proponent should comply with relevant South African labour legislation when retrenching employees • juwi should also implement appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning • All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse	Moderate	Low	4	Hig h

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													
Exacerbated in-migration	Disruption of social structures	Negative	Local	Medium to long-term	Substantial	Likely	Low	Moderate	n/a	Moderate	N/A	3	Medium

6.1.7 Soils and Agricultural Potential (Impact Statement)

The purpose of the Soils and Agricultural Potential Impact Statement (**Appendix N1**) was to review the existing information contained in the reference studies that were conducted for Solar PV developments in the Kenhardt area (see reference list in Section 7, Appendix N). The Impact Statement was compiled by the CSIR and externally reviewed by Mr. Johann Lanz (2018). The impacts on agricultural potential and soils of the proposed development have been identified in the table below and mitigation measures have been proposed (see further mititgation measures in the EMPr).

The proposed development is located on level plains with some relief in the Northern Cape interior at an altitude of between 900 and 1000 meters. Slopes across the site are almost entirely less than 2%. The underlying geology is migmatite, gneiss and granite of the Namaqualand Metamorphic Complex with abundant calcrete. There are no perennial drainage courses within the proposed Skeerhok PV 2 project area. There are temporary drainage courses, typical of arid environments, where surface run-off would accumulate and flow, but this would only occur very occasionally, immediately after high rainfall events.

Due to both the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing. The site is within one of South Africa's eight proposed REDZs, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors. These factors include an assessment of the significance of the loss of agricultural land. Renewable energy development is therefore a very suitable land use option for the site.

6.1.7.1 Impact Assessment

The proposed developments are located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable and important for agricultural production. The proposed site is however on land which has very low agricultural potential and is only suitable for low intensity grazing.

All impacts are evaluated in terms of their consequence for agricultural production, not in terms of the impact *per se*. This is because it is agricultural production that must be the focus of an agricultural assessment. Because the undisturbed site already has extremely limited agricultural potential, it means that the consequence of any impact for agricultural production is limited with the result that the consequence and significance of agricultural impacts is low. Furthermore, the poor, very shallow soil conditions reduce the significance of loss of topsoil and the low slope gradients reduce the significance of potential erosion impacts. Irreplaceability of resources is considered low because the resource that is being impacted is non-arable, low potential grazing land which is not a scarce resource in the country. The confidence level of the assessment is considered high because there is certainty about the low agricultural potential of the land and the impacts are fairly easy to understand and predict. There are a large number of other potential projects in the area that will also lead to a loss of agricultural land. Although the loss of individual project portions of land has low significance, as discussed above, the cumulative impacts of land loss regionally becomes more significant. However, despite this cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to regions such as this one, with very low agricultural potential. It is preferable to incur a higher cumulative loss in such a region, than to lose agricultural land with a higher production potential elsewhere in the country.

Impacts and mitigation measures are described in the table below. Recommendations for the monitoring and review of all identified mitigation measures are described below, as well as the EMPr.

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 DECOMMISSIONING PHASE DIRECT IMPACTS													
Vehicle traffic and dust generation	Veld degradation	Negative	Site	Medium term	Slight	Likely	Moderate	Low	• Minimize footprint of disturbance. • Confine vehicle access on roads only. • Control dust generation during construction and decommissioning activities by adopting standard construct site dust control methods (such as dampening surfaces with water), where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.	Very Low	Very Low	5	High
Constructional and decommissioning activities that disturb the soil profile.	Loss of topsoil	Negative	Site	Medium term	Slight	Likely	Moderate	Low	• Strip and stockpile topsoil from all areas where soil will be disturbed. • After cessation of disturbance, re-spread topsoil over the surface. • Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	Very Low	Very Low	5	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)**		
CONSTRUCTION, OPERATION AND DECOMMISSIONING PHASE DIRECT IMPACTS													
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Long term	Slight	Very Likely	High	Low	• None	Very Low	Not applicable	5	High
Constructional and decommissioning activities that disturb the soil profile.	Loss of topsoil	Negative	Site	Medium term	Slight	Likely	Moderate	Low	• Strip and stockpile topsoil from all areas where soil will be disturbed. • After cessation of disturbance, re-spread topsoil over the surface. • Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	Very Low	Very Low	5	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)		
CONSTRUCTION AND DECOMMISSIONING PHASE INDIRECT IMPACTS													
Change in surface characteristics and surface cover.	Erosion	Negative	Site	Long term	Slight	Likely	Low	Low	• Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	Low	Very Low	5	High
Project rental	Additional land use income	Positive	Site	Long term	Slight	Very Likely	High	Low	• None	Very Low	Very Low	5	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)		
CUMULATIVE IMPACTS													
Occupation of the land by the infrastructure of multiple projects	Regional loss of agricultural land	Negative	Regional	Long term	Likely	Likely	Moderate	Moderate	None	Moderate	Not Applicable	3	Low

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 7:

Conclusions

CONTENTS

TABLES

FIGURES

7 CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the main conclusions and recommendations from the EIA Process, provides the key findings of the specialist studies (i.e. outlines the most significant impacts identified, together with the key management actions required to avoid or mitigate the negative impacts or enhance positive benefits), an integrated summary of impacts that will influence decision-making by the Competent Authority (i.e. the DEA) and the associated management actions. In addition, the chapter also includes the EAP's opinion on whether the project should receive EA.

7.1 SUMMARY OF IMPACT SIGNIFICANCE: MAIN IMPACTS AND KEY RECOMMENDATIONS

The 2014 NEMA EIA Regulations (as amended on 7 April 2017) define a significant impact as "*an impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence*".

Based on the definition above, this section provides a summary of significant impacts identified and assessed by the specialists in **Appendices I to N** of this Draft EIA Report and summarised in Chapter 6 (as noted in Table 7.1 below).

Table 7.1: Specialist Studies and Statements

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Simon Bundy	Sustainable Development Projects (SDP)	Ecological & Hydrological Impact Assessment (including Terrestrial and Aquatic Ecology)
Jon Smallie	Wild Skies Ecological Services	Avifauna Impact Assessment
Luanita Snyman-Van der Walt	CSIR	Visual Impact Assessment
Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
EXTERNAL REVIEWERS		
Christo Bredenhann	WSP	Review of the Traffic Impact Statement compiled by the CSIR using existing studies in the project area.
Rudolph du Toit	Applied Science Associates (Pty) Ltd	Review of the Social Impact Statement compiled by the CSIR using existing studies in the project area.
Johann Lanz	N/A	Review of the Soils and Agricultural Impact Statement compiled by the CSIR using existing studies in the project area.
Andrea Gibb	SiVEST	External review of the VIA

The Visual Impact Assessment specialist study (included in Appendix M of this Draft EIA Report) was subject to a peer review process by an external reviewer (Andrea Gibb, SiVEST), as requested by the DEA. This external review report is included as an appendix to the Visual Impact Assessment. It must be noted that the recommendations for edits to be made to the VIA **have been made** post external review. Appendix M reflects those requested changes by SiVEST.

An Impact Statement for Agriculture, Traffic and Social was also compiled by the EAP and is included in Appendices N1 – N3 of this Draft EIA Report. These statements were externally reviewed (as described in Table 7.1 above) and a letter of confirmation of this is included in each statement. It must be noted that the statements serve as a general description of the existing and predicted impacts associated with the proposed project (using information from existing studies in the area) and does not classify as a specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations (as amended on 7 April 2017). Furthermore, the statements considered the full development (i.e. the development of the three Solar PV Facilities (i.e. Skeerhok PV 1, 2 and 3) and the associated electrical infrastructure (which subject to a separate BA Process).

In addition, a Radio Frequency Interference (RFI) Survey Technical Study was commissioned by the Project Applicant to determine the impact of the proposed project on the SKA. This report is not a standard specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations, as it is a detailed, technical report which provides a cumulative topographical analysis of the proposed PV projects in the Astronomy Geographic Advantage Area and was undertaken to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project. The full RFI study can be found in **Appendix P**, and comment from SKA on the proposed Skeerhok PV 1, 2 and 3 projects can be found in **Appendices G and O.**

All the mitigation and management measures proposed by the specialists, including those additional impacts and management measures identified by the EAP have been included in the EMPr (Part B of this Draft EIA Report).

7.1.1 Ecological and Hydrological Impact Assessment

An Ecological Impact Assessment (including hydrology) (Appendix I of this Draft EIA Report) has been undertaken assess the potential impacts to ecological and hydrological features present on site. Table 7.2 illustrates a summary of the total number of impacts identified in the Ecological Impact Assessment.

Table 7.2: Summary of Ecological and Hyrdological Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase – Direct Impacts	8	4	3	1	0	6	2	0	0
Construction Phase – Indirect Impacts	6	4	1	1	0	5	1	0	0
Operational Phase – Direct Impacts	6	3	2	1	0	4	2	0	0
Operational Phase – Indirect Impacts	2	1	0	1	0	1	1	0	0
Decommissioning Phase – Direct Impacts	4	0	3	1	0	0	4	0	0
Cumulative Impacts	11	2	4	4	1	5	5	1	0
TOTAL IMPACTS	37								

The impacts in the Ecological Impact Assessment were rated with a negative status. No positive impacts have been identified in the assessment. Overall, as indicated in Table 7.2, the majority of the impacts identified in the Ecological and Hydrological Impact Assessment are predicted to be of a **low or very low significance** without the implementation of mitigation measures. Following the implementation of the proposed mitigation measures, the overall impact to ecology is considered to be **very low significance**. Overall, no impacts were assessed as being of high significance after the implementation of mitigation measures.

The following main mitigation measures were identified in the Ecological Impact Assessment specialist study and noted in the EMPr (Part B of the Draft EIA Report):

Pre-Construction:

- Pre-construction evaluation and possible plant rescue operations;
- Identification of intrusion of the proposed construction site and development footprint, into minor drainage lines (if any);
- Identification of laydown areas, roadways etc. on site and evaluation of affected points within site, particularly in respect of floral and faunal presence; and
- Permitting requirements in terms of the National Water Act and Northern Cape Conservation Act.

Construction Phase:

- Site induction and interaction within management on ecological aspects;
- Site inspection of any fauna within the construction area during post fencing completion;
- Monitoring of operations, including species presence within site, mortalities and sitings;
- Maintenance of vegetation and avoidance of unnecessary clearance of site;
- Exotic weed management; and
- Erosion control measures to be implemented where applicable.

Operational Phase:

- Monitoring of faunal activities within the fenced area of the site and immediate proximity of site;
- Management of faunal intrusion through the fencing, including possible mortalities;
- Consideration of lighting regime around the site and the impact of ELP.
- Vegetation management on site – consideration of redress methods of growth and habitat form around site;
- Exotic weed management; and
- Erosion control measures.

7.1.1.1 Overall conclusion

The Ecological and Hydrological Impact Assessment concludes that based on the consideration of the site and its present ecological state, as well as the nature of the proposed development, it is in the specialists opinion that the development cannot be precluded from the site on ecological or hydrological grounds, provided that suitable measures, as noted in the study (Appendix I) are implemented.

7.1.2 Visual Impact Assessment

As noted above, a Visual Impact Assessment specialist study was conducted (included in Appendix M) for the proposed construction of the Skeerhok PV 2. The assessment concluded that the landscape surrounding the proposed site has a rural agricultural character which has been transformed by extensive stock farming and large scale infrastructure in the form of the Sishen-Saldanha ore railway line and Eskom Nieuwehoop Substation.

Table 7.3 illustrates a summary of the total number of impacts identified in the Visual Impact Assessment.

Table 7.3: Summary of Visual Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	5	0	3	2	0	3	2	0	0
Operational Phase: Direct Impacts	3	0	1	2	0	1	2	0	0
Decommissioning Phase: Direct Impacts	5	0	3	2	0	3	2	0	0
Cumulative Impacts	1	0	0	1	0	0	0	1	0
TOTAL IMPACTS	14								

The majority of the impacts identified in the Visual Impact Assessment were rated with a negative status. Overall, as indicated in Table 7.3, the impacts identified in the Visual Impact Assessment are predicted to be of a **moderate** significance without the implementation of mitigation measures and **low** with mitigation.

The following main mitigation measures were identified in the Visual Impact Assessment specialist study:

<u>Construction Operation and Decommissioning Phases:</u>

- Minimise the footprint of cleared vegetation.
- Where possible, laydown areas and temporary construction equipment and camps should be placed in already disturbed areas in order to minimise vegetation clearing.
- Phased clearance of the area for solar field in order to reduce the amount and duration of bare soil exposure.
- Commence with restoration of disturbed, cleared land as soon as possible.
- Maintain rehabilitated surfaces until vegetation is established, sustainable and blends well with surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Control Officer (ECO).
- Plan trips so that it occurs during the day and where possible avoid construction vehicles movement on the regional road during peak time
- Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only.
- Develop a lighting plan that:
  - documents the design, layout and technology used for lighting;
  - indicates how nightscape impacts will be minimised;
  - includes a process for quick and effective resolution of lighting complaints; and
  - Do not exceed the minimum lighting requirement for effective safety and security.
  - Minimise bright light (uplighting and glare) with appropriate screening.
  - Reduce light pollution through the use of low-pressure sodium light sources.
  - Light fittings for security at night should reflect the light toward the ground and prevent light spill.
  - Avoid light spilling beyond the project boundary.
  - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting.
  - Switch off lights when not in use.
- Implement standard construction site dust control methods (i.e. dampening with water) as required.
- Implement fire risk reduction and containment measures, including:

  - worker awareness;
  - designated, safe smoking areas;
  - fire breaks; and
  - appropriate and working firefighting equipment.
- Use appropriate coloured materials for structures to blend in with the backdrop of the area where this is technically feasible and where the colour or paint will not negatively affect the functionality of the structures.
- Maintain painted features and repainted when colours fade or paint flakes.
- Choose materials, coatings and paints with minimum reflectivity where possible.
- Paint grouped structures the same colour to reduce colour contrast.
- Construct powerline towers to be similar to those already existing in the landscape, where possible.
- Use appropriate coloured materials for structures to blend in with the backdrop of the area where this is technically feasible and where the colour or paint will not negatively affect the functionality of the structures.
- Maintain painted features and repainted when colours fade or paint flakes.
- Paint grouped structures the same colour to reduce colour contrast.
- Adequate implementation of proposed mitigation measures and best practice to reduce visual impacts by all solar PV facilities in the vicinity.

7.1.2.1 Overall conclusion

The impact of visual intrusion to the views of potential sensitive visual receptors is expected to be moderate to low (before mitigation) and moderate to very low with the effective implementation of the mitigation and management actions outlined in this report. The impacts vary depending on the impact pathway being assessed.

Due to the existing landscape character, and foreseeable trend of renewable energy and associated electricity infrastructure development in the area, the cumulative impacts to the views of potential sensitive visual receptors are expected to be moderate, if all solar PV developments implement proposed mitigation measures and best practice to reduce visual impacts.

Based on the findings in the VIA it has been concluded that the juwi Skeerhok PV development, including its associated electricity infrastructure, from a visual, scenic, aesthetic and amenity perspective, may receive EA with adherence to the mitigation and management measures set out in this report.

7.1.3 Heritage Impact Assessment (Archaeology and Cultural Landscape) and Desktop Palaeontology Assessment

A Heritage Impact Assessment was undertaken as part of the EIA Process (included in Appendix K). A desktop Palaeontological Impact Assessment was also undertaken as part of the EIA Process (attached to the HIA in Appendix K) to provide an assessment of potential impacts on local palaeontology (i.e. fossil) within the proposed Skeerhok PV 2 facility area.

Table 7.4 illustrates a summary of the total number of impacts identified in the HIA (including palaeontology).

Table 7.4: Summary of Heritage and Palaeontology Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	4	2	1	1	0	3	1	0	0
Operational Phase: Direct Impacts	1	0	1	0	0	0	1	0	0
Decommissioning Phase: Direct Impacts	1	0	1	0	0	0	1	0	0
Cumulative Impacts	4	2	2	0	0	3	1	0	0
TOTAL IMPACTS	10								

All the above impacts were rated with a negative status. Overall, the above impacts are predicted to be of a **low significance** with the implementation of mitigation measures. No impacts were assessed as being of high significance.

The following mitigation and monitoring requirements should be adhered to:

Mitigation requirements

At this point there is just one archaeological site that would require mitigation prior to construction because it falls within the proposed development footprint and will very likely not be avoidable (Figure 26, Appendix K). No other significant sites were located within the project footprint. However, because it was not practical to conduct a comprehensive survey of the entire study area and the linear feature layouts were not available for field study, it is suggested that a pre-construction walk down survey be carried out during the design phase. The ECO will need to ensure that this survey is commissioned at least 6 months in advance of construction in order to allow for the mitigation process to be carried out as necessary.

Monitoring requirements

At this point there are no significant archaeological sites that would require *in situ* conservation during development. This means that no specific monitoring requirements can be posed. However, whenever the ECO is on site they should be aware of any potential heritage material that may still be undiscovered. Graves are the main potential issue here. Any such material found would require immediate *in situ* preservation and reporting to SAHRA.

Although the chances of locating palaeontological material are extremely small, the ECO should make staff aware of this possibility and ensure that a reporting procedure is followed. The 'Chance Fossil Finds Procedure' include in the palaeontological specialist study (see Appendix 2) should be followed.

7.1.3.1 Overall conclusion

The Palaeontological Impact Assessment concludes that there are no fatal flaws in the proposed development, nor are there objections to its authorisation as far as fossil heritage conservation is concerned, since significant impacts on scientifically valuable fossils or fossil sites are not anticipated.

The HIA concluded that because the potential impacts are few and entirely manageable, it is recommended that the proposed project be allowed to continue, should the mitigation and monitoring requirements be met.

7.1.4 Avifaunal Impact Assessment

An Avifaunal (bird) Assessment (Appendix J) was conducted as part of the EIA Process in order to identify and assess impacts associated with the construction and operation of the proposed project on the bird population and habitat in the project area.

It must be noted that the results of three seasons of bird monitoring have been included in this DEIAR which is in line with the **Regime 2** (Best practice guidelines, Jenkins *et al.,* 2017). Note this excerpt from the Avifaunal Specialist Study (Appendix J):

*"**NOTE:** For the purposes of this study we conducted **2 specialist site visits and 3 seasons** of on-site bird monitoring, in accordance with the best practice guidelines (Jenkins et al, 2017). The proposed project falls under **Regime 2** on account of being of 'medium' avifaunal sensitivity and greater than 150ha in extent. This means it requires 2 to 3 site visits of 3 to 5 days duration each over 6 months. We conducted 3 x 4 day site visits thereby slightly exceeding the minimum requirements in our view."*

Thus, there is **no incomplete information in this report** in terms of Avifaunal impacts or information being withheld from the public in this regard.

Table 7.5 illustrates a summary of the total number of impacts identified in the Avifaunal Assessment.

Table 7.5: Summary of Avifaunal Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase Impacts	**2**	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**0**
Operational Phase Impacts	**4**	**0**	**3**	**1**	**0**	**0**	**4**	**0**	**0**
Decommissioning Phase Impacts	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**
Cumulative Impacts	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**
TOTAL IMPACTS	**8**								

As derived from Table 7.6 above, it is clear that all impacts were identified with a overall **low significance** with the implementation of mitigation measures. The impacts identified above are all rated with a negative status. The cumulative impact is considered to be **high** prior to the implementation of the required mitigation measures are but **moderate**, following mitigation.

The following main mitigation measures were identified in the Avifaunal Impact Assessment:

Construction, Operational and Decommissioning Phases:

- Water courses, drainage lines, streams and wetlands should be avoided and a no go buffer of 100m be applied around them.
- Dams and livestock water points should likewise be avoided with a 100m no go buffer.
- Rocky outcrops should be avoided with a 100m no go buffer.
- All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.

- Care should be taken not to introduce or propagate alien plant species/weeds during construction.
- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.
- Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.
- Very little is known about the impacts of solar facilities on birds in South Africa. For this reason post construction monitoring programme is recommended for this site in order to document any impacts and provide the basis for an adaptive management approach to any impacts.
- Mitigation is complex at electrical structures since there are many ways in which birds could get electrocuted as the hardware is complex and provides many different potential perches for birds. It is therefore recommended that mitigation be applied reactively once the facility is operational, only if a significant problem is detected. Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.
- We recommend that the operational phase EMPr include provision for application to the provincial authority for permits for any necessary nest management.

7.1.4.1 Overall conclusion

The Skeerhok PV 2 site is important habitat for an assemblage of arid zone bird species, many of which are endemic. The transformation of natural habitat for the proposed facility will therefore be of high significance. Fortunately, the facility will transform a small area relative to the remaining habitat, which is fairly uniform in the broader area. The impact of habitat destruction can be mitigated to moderate significance by ensuring that the more sensitive micro habitats are designated as no go areas. All other impacts are of moderate to low significance. It is recommended that the facility be authorised, provided that the recommendations of this report are implemented.

7.1.5 Soils and Agricultural Potential Impact Statement

A Soils and Agricultural Potential Impact Statement (Appendix N1) was conducted as part of the EIA Process using existing studies in the area in order to identify and assess all potential impacts of the proposed development on agricultural resources including soils and agricultural production potential, and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

Table 7.6 illustrates a summary of the total number of impacts identified in the Soils and Agricultural Potential Statement.

Table 7.6: Summary of Soils and Agricultural Potential Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	**2**	2	0	0	0	2	0	0	0

Construction Phase: Indirect Impacts	**2**	1 (+)[1]	1	0	0	2	0	0	0
Operational Phase: Direct Impacts	**2**	2	0	0	0	2	0	0	0
Decommissioning Phase: Direct Impacts	**2**	2	0	0	0	2	0	0	0
Decommissioning Phase: Indirect Impacts	**2**	1(+)	1	0	0	2	0	0	0
Cumulative Impacts	**1**	0	0	1	0	0	0	1	0
TOTAL IMPACTS	**11**								

All of the above impacts were rated with a negative status, except for the impact relating to the generation of additional land use income through the rental of the land for the proposed solar energy facility, which was rated with a positive status.

Most impacts, apart from the cumulative impact, were assessed as having a **very low significance**.

The following main mitigation measures were identified in the Soils and Agricultural Potential Assessment:

Construction, Operational and Decommissioning Phases:

- Minimize the footprint of disturbance during construction and decommissioning activities.
- Confine vehicle access to roads only.
- Control dust generation during construction and decommissioning activities by implementing suitable, standard construction site dust control measures.
- Strip and stockpile topsoil from all areas where soil will be disturbed.
- After cessation of disturbance, re-spread topsoil over the surface.
- Dispose of any sub-surface spoil material, generated from excavations, where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.
- Undertake a periodic site inspection to verify the occurrence of off-road vehicle tracks surrounding the site.
- Establish an effective record keeping system for each area where soil is disturbed for constructional and decommissioning purposes. Recommendations for the recording system are included in the EMPr (Part B of the EIA Report).
- Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring

7.1.5.1 Overall conclusion

The study concludes that because of the low agricultural potential of the site, the development should, from an agricultural impact perspective, be authorised.

[1] This indicates that this impact is rated as positive

7.1.6 Social Impact Statement

A Social Impact Statement (included in Appendix N3) was compiled by the EAP using existing studies and reviewed externally to investigate the potential social disruptors and associated social impacts likely to result from the proposed project.

Table 7.7 below illustrates a summary of the total number of impacts identified in the Social Impact Statement.

Table 7.7: Summary of Social Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	**Very Low**	**Low**	**Moderate**	**High**	**Very Low**	**Low**	**Moderate**	**High**
Construction Phase Impacts	**6**	0	2 (1+)[2]	4 (2+)	0	1	3	2	0
Operational Phase Impacts	**6**	0	2 (1+)	4 (2+)	0	1	3	2	0
Decommissioning Phase Impacts	**1**	0	0	1	0	0	1	0	0
Cumulative Impacts	**1**	0	0	1	0	0	0	1	0
TOTAL IMPACTS	**14 (6+)**								

No impacts were assessed as being of high significance with or without the implementation of mitigation. The overall significance rating of the negative and positive socio-economic impacts associated with the proposed project is **moderate.**

The following main mitigation measures were identified in the Social Impact Statement:

<u>Construction and Operational Phase:</u>

- Develop and implement a Workforce Recruitment Plan;
- Reserve employment, where practical, for local residents;
- Clearly define and agree upon the Project Affected People (PAP);
- Develop a database of PAP and their relevant skills and experience, or use an existing legitimate database of skills and expertise;
- Develop and implement a Stakeholder Engagement Plan;
- Delivery on the Economic Development Plan must be contractually binding on the proponent;
- Procure goods and services, where practical, within the study area;
- Obtain regularly required goods and services from as large a selection of local service providers as possible;
- The proponent should engage with local NGOs, CBOs and local government structures in the Kenhardt community to identify and agree upon relevant skills and competencies required;
- Such skills and competencies should then be included in the Economic Development Plan; and
- Where possible, align the Economic Development Plan with Local Municipality's IDP.

<u>Decommissioning Phase:</u>

[2] This indicates that 1 of the 2 impacts were rates as positive

- The proponent should comply with relevant South African labour legislation when retrenching employees;
- juwi should also consider appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning; and
- All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.

7.1.6.1 Overall conclusion

The overall significance rating of the *negative* socio-economic impacts associated with the proposed project is *low to moderate*; whereas the overall significance rating of the *positive* socio-economic impacts associated with the proposed development is **moderate.**

It should be accepted that the development of the proposed projects is likely 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 medium significance negative impact of the project, as compared to the overall medium-high 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.

7.1.7 Traffic Impact Statement

A Traffic Impact Statement was produced by the EAP to show the amount of traffic that can be expected during the construction and operational phase of the proposed development of the proposed project. This statement was externally reviewed (Appendix N2).

Table 7.8 below illustrates a summary of the total number of impacts identified in the Traffic Impact Statement.

Table 7.8: Summary of Traffic Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase Impacts	**4**	0	2	1	1	0	3	1	0
Operational Phase Impacts	**4**	1	1	1	1	1	2	1	0
Decommissioning Phase Impacts	**4**	0	2	1	1	0	3	1	0
Cumulative Impacts	**3**	1	0	1	1	1	1	1	0
TOTAL IMPACTS	**15**								

Overall, the majority of the impacts identified as part of the TIS are predicted to be of a **low significance** without and with the implementation of mitigation measures. All impacts identified as being of **high significance are mitigated to moderate**, following the implementation of mitigation.

The following main mitigation measures were identified in the TIS:

<u>Construction, Operational and Decommissioning Phases:</u>

- 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 and the PGNC Department of Public works, Roads and Transport.
- 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.

7.1.7.1 Overall conclusion

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 the reference projects, the overall impact from traffic generation is anticipated to be **low** when implementing suitable mitigation measures. The highest traffic will be generated during the construction phase.

7.1.8 Radio Frequency Interference Study

Interference Testing and Consultancy Services (Pty) Ltd was appointed by the juwi Renewable Energies to undertake a test on radio frequency emissions to determine technology risks (power conversion, trackers control systems, etc.) of a renewable energy system (Appendix P). This study included potential impact and mitigation requirements.

It was concluded that based on the current SKA location information, the impact analysis shows that without adequate mitigation a possible interference scenario between the Skeerhok PV1 and the SKA installations may occur. 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 should they be constructed, totalling less than 20dB. In a letter of formal correspondence the SKA South Africa supports the view that the required attenuation is achievable following appropriate design decisions and implementation of mitigation measures. However the project is required to prepare and submit an EMC (Electromagnetic Compatability) Control Plan to SKA South Africa for approval prior to any detailed design and construction activities associated with the proposed facilities.

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7.2 SUMMARY: COMPARATIVE ASSESSMENT OF POSITIVE AND NEGATIVE IMPACTS

Section 7.1 provides a summary of the findings of the specialist studies (or statements) that were undertaken as part of this EIA Process. Table 7.9 summarises the overall significance of these impacts following the implementation of the recommended mitigation and management measures. **From this table it can be seen that no negative impacts of high significance are anticipated to occur as a result of this project provided the stipulated management actions are implemented effectively.** The positive impacts generated by the project (as seen in the table below) are associated with the economic benefits from employment opportunities, and the additional source of income from the rental of the land for the construction and operation of the PV facility.

Table 7.9: Comparative Assessment of Positive and Negative Direct and Indirect Impacts

Specialist Study	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
Ecological and Hydrological Impact Assessment	Negative: Very Low	Negative: Very Low
Palaeontology/Archaeology/Heritage Impact Assessment	Negative: Low	Negative: Very Low
Visual Impact Assessment	Negative: Moderate	Negative: Low
Avifauna Impact Assessment	Negative: Moderate	Negative: Low
Soils and Agricultural Potential Impact Statement	Negative: Very Low	Negative: Very Low
	Positive: Very Low	Positive: Very Low
Traffic Impact Statement	Negative: Low	Negative: Low
Social Impact Statement	Negative: Moderate	Negative: Low
	Positive: Moderate	Positive: Moderate

7.3 CONSIDERATION OF ALTERNATIVES

The alternatives that were considered as part of the EIA Phase for the Skeerhok PV 2 facility are included in Chapter 5 of this EIA Report.

7.3.1 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 Skeerhok PV 2 project. This alternative would result in no environmental impacts on the site or surrounding local area. 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 100 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 17 800 MW by 2030;

- Additional power to the local grid will need to be provided via the Eskom grid, with approximately 90% coal-based power generation with associated high levels of CO_2 emissions and water consumption;
- 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;
- Local communities will continue their dependence on agriculture production and government subsidies. The local municipality's vulnerability to economic downturns will increase because of limited access to capital;
- There will be no opportunity for additional employment in an area where job creation is identified as a key priority. Approximately 1600 (600 direct and 1000 indirect) employment opportunities will be created during the construction period and 200 (50 direct and 150 indirect) employment opportunities will be created during the operation period of the proposed project;
- 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, the proposed implementation of an Economic Development Plan and the creation of local employment opportunities will not be realised; and
- The local economic benefits associated with the REIPPPP 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:

- There will be no development of solar energy facilities at the proposed location;
- Only the agricultural land use will remain;
- No vegetation will be removed or disturbed during the development of these facilities; No avifauna will be negatively impacted on;
- No change to the current landscape will occur;
- No heritage artefacts will be impacted on; and
- No additional water use during the construction phase and the cleaning of panels during the operational phase.

As discussed in Chapter 1 of this Draft EIA Report, the purpose of the proposed Skeerhok PV 2 project is to feed electricity generated by a renewable energy resource into the national electricity grid. Many other socio-economic and environmental benefits will result from the development of this project such as development of renewable energy resources in the country and contribution to the increase of energy security, employment creation and local economic development (as noted above).

In addition, the Soils and Agricultural Potential Statement (Appendix N1) notes that the land on which the proposed project will be constructed is of low agricultural potential and is not suitable for cultivation. Therefore, the current land-use (i.e. agricultural use) is not deemed as the preferred alternative and can still continue around the site for the lifetime of the project.

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, nor will it generate an alternative land-use income from the solar energy facility. It will also 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.

7.3.2 Land-Use Alternative

As discussed above, the sole use of the land for agriculture is not a preferred alternative.

Where the "activity" is the generation of electricity, possible reasonable and feasible land-use alternatives for the proposed properties include Biomass, Hydro Energy and Wind Energy. However, based on the preliminary investigations undertaken by the Project Applicant, no other renewable energy technologies are deemed to be appropriate or suitable for the site. Furthermore, from an impact and risk assessment perspective, the implementation of a solar PV project on the proposed project site will result in fewer risks and low significance impacts in comparison to the implementation of wind energy, hydro power and biomass.

As previously noted, the proposed solar facility currently falls within the REDZ 7. The proposed project is therefore in line with the criteria of the SEA and located in an area of strategic importance for Solar PV development. It should be noted that even if a project falls within a REDZ, the proposed development still requires site specific assessments as per the site protocol (still in development and not yet promulgated) in order to determine the potential impacts of a project at a local and site specific level.

Therefore, the implementation of a solar energy facility at the proposed project site is more favourable and feasible than other alternative energy facilities (i.e. for generating 20 MW or more from a renewable resource). Therefore in terms of project and location compatibility, the proposed solar facility is considered to be the most feasible renewable energy land use alternative. The experience that the Project Applicant has within the solar energy development industry will positively benefit the proposed project.

7.3.3 Site and Location Alternatives

As discussed in Chapter 5 of this EIA Report, only the preferred site for the Skeerhok PV 2 facility has been assessed in this EIA. From an impact and risk assessment perspective, the implementation of a solar PV project on Portion 9 of Gemsbok Bult Farm 120 will result in fewer risks in comparison to its implementation at an alternate site 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 Skeerhok PV 2 facility is one phase of a bigger project by juwi to develop three Solar PV Facilities in total. The main determining points for juwi 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 Portion 9 of Gemsbok Bult Farm 120, no other location or site alternatives have been considered in the EIA Phase.

7.3.4 Layout Alternatives

As part of the EIA, a larger 400 ha area was assessed by the specialists and considered during this EIA. The Development Envelope has been determined for the project based on the environmental sensitivities present on the site, which is discussed further in Appendices I to N of this EIA Report. Based on the findings of the specialist studies, an environmental sensitivity map has been produced which shows the sensitivities on site within the larger 400 ha buildable area that was assessed. Based on this map, the preferred location for the 300 ha Skeerhok PV 2 facility (i.e. Development Envelope), avoids the sensitive features that were identified by the specialists within the original 400 ha buildable area. The preferred layout is shown in Figure 7.2.

It is important to note that should the layout change subsequent to the issuing of an EA (should such authorisation be granted), any alternative layout or revisions to the layout occurring within the boundaries of the Development Envelope would not be regarded as a change to the scope of work or the findings of the impact assessments undertaken during the EIA Phase.

7.3.5 Technology Alternatives

As discussed in Chapter 2 and Chapter 5 of the Draft EIA Report, only the PV solar panel technology type has been considered in the EIA Phase.

The main mounting systems that will be considered as part of the design are:

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

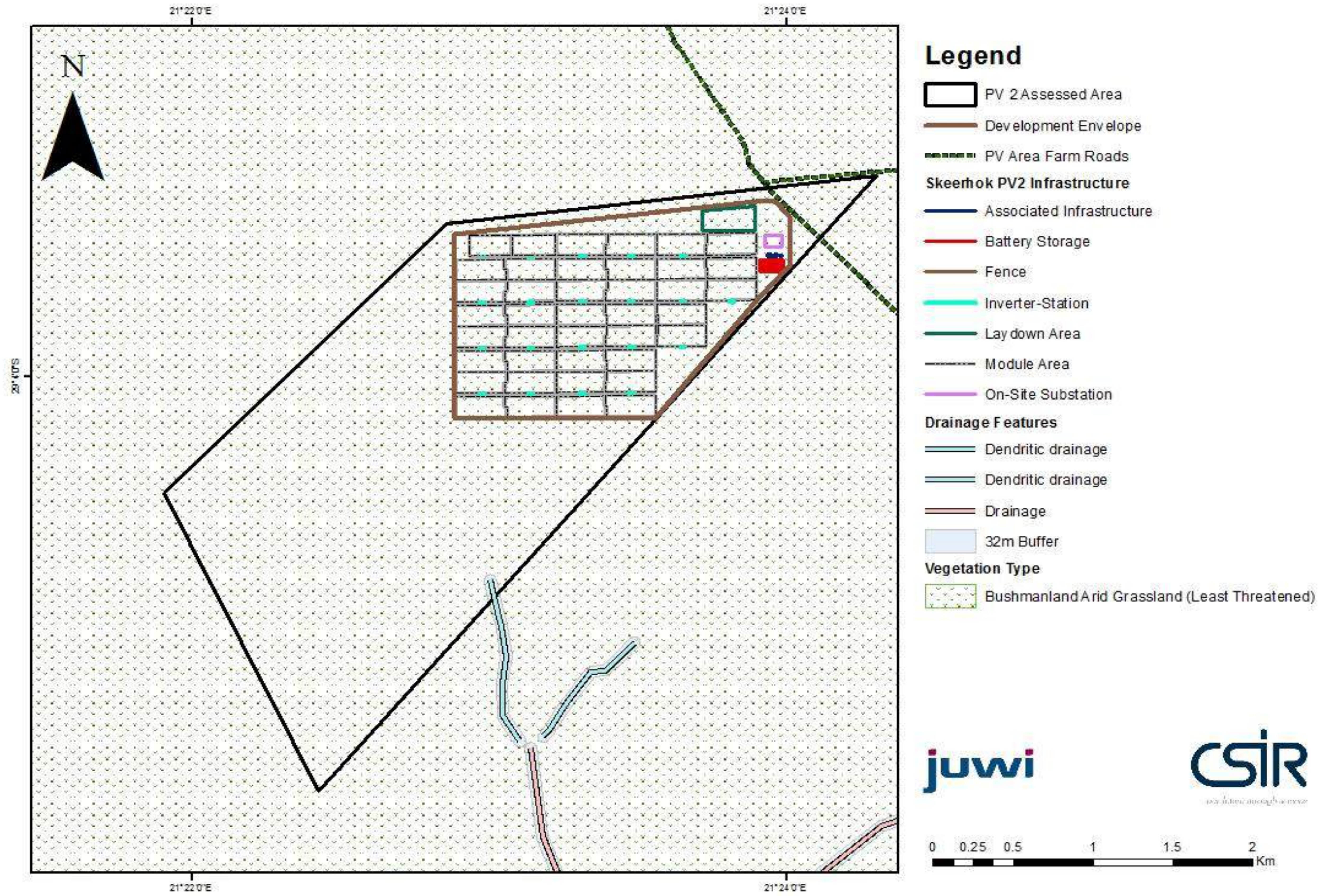

Figure 7.2: Site layout overlain onto an Environmental Sensitivity Map for the Proposed Skeerhok PV 2 Facility

7.4 PERMITS AND LICENSES REQUIRED

7.4.1 NEMA and 2014 NEMA EIA Regulations

Before clearing of the proposed site is initiated, an EA must be granted by the DEA in terms of the NEMA and associated 2014 NEMA EIA Regulations (as amended on 7 April 2017). This report has been has been compiled to provide the DEA with the information required in order to make an informed decision on whether to grant or reject EA.

7.4.2 Permit in terms of the National Water Act (Act 36 of 1998)

The National Water Act (Act 36 of 1998) controls activities in and around water resources, as well as the general management of water resources, including abstraction of groundwater and disposal of water. As noted in Chapter 4 of this EIA Report, Section 21 of the Act lists the following water uses that need to be licensed:

a) taking water from a water resource;
b) storing water;
c) impeding or diverting the flow of water in a watercourse;
d) engaging in a stream flow reduction activity contemplated in section 36;
e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) disposing of waste in a manner which may detrimentally impact on a water resource;
h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i) altering the bed, banks, course or characteristics of a watercourse;
j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k) using water for recreational purposes.

The Ecological Impact Assessment states that authorisation for changes in land use up to 500 m from a defined water resource/wetland system will require an application for a Water Use Licence from the DWS. A Water Use Licence will be required in respect of the proposed development under Section 21 (c) and (i) of the Act, however such licence should not preclude this development. The DWS will be consulted with during the EIA Process to confirm the need for a WUL, as well as to seek comment on the proposed project.

7.4.3 Permit in terms of the National Forest Act (Act 84 of 1998)

The Ecological Impact Assessment notes that the National Forest Act (Act 84 of 1998) governs the removal, disturbance, cutting or damage and destruction of identified “protected trees”. Listed species that may be encountered with the site include Boscia spp and possibly *Acacia erioloba*. The assessment also notes that it is unlikely that an application for the “clearing of a natural forest”, as defined within the Act, will be required on the site.

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 DAFF.

7.4.4 Permit in terms of the Northern Cape Nature Conservation Act (Act 9 of 2009)

The Ecological Impact Assessment notes that the Northern Cape Conservation Act (Act 9 of 2009) under its pertinent regulation governs the disturbance of species, or possibly other species not yet identified on site. A permit from the Provincial Department of Environment and Nature Conservation (DENC) will be required in order to disturb or translocate such species. 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 DENC. The relocation of the *Aloe dichotoma* as it falls within the development footprint of the proposed PV facility will require a permit in terms of the Northern Cape Conservation Act (Act 9 of 2009).

7.4.5 Permit in terms of the National Heritage Resources Act (Act 25 of 1999) (NHRA)

As noted in the Heritage Impact Assessment (Appendix K), the NHRA does not require the developer to obtain permits prior to construction. However, any archaeological mitigation work (i.e. test excavations, sampling etc.) that may be required (in the event of archaeological resources or graves of significance being found within the development footprint during construction) would need to be conducted under a permit issued to, and in the name of, the appointed archaeologist. The permit application process allows the heritage authorities to ensure that a suitably qualified and experienced archaeologist undertakes the work and that the proposed excavation/sampling methodology is acceptable.

In terms of palaeontology, where palaeontological mitigation is required in the event of any fossil material found on site during construction, the palaeontologist concerned with mitigation work would need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).

7.4.6 Astronomy Geographic Advantage (Act 21 of 2007)

As mentioned previously RFI studies have been undertaken and commissioned by the Project Applicant to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project. The SKA Project Office has provided comment which can be seen in Appendix O. The mitigation of all risk associated with RFI on the SKA must be confirmed by measurement following construction to the satisfaction of the SKA Office. Should the risk of radio interference still exist, based on measurements, further mitigation methods must be implemented to remove outstanding risk of radio frequency interference.

7.5 OVERALL EVALUATION OF IMPACTS BY THE EAP

Based on the findings of the specialist studies the proposed project is considered to have an **overall very low to low negative environmental impact and an overall moderate positive impact** (with the implementation of respective mitigation and enhancement measures).

The proposed project will take place within the Development Envelope, as discussed in Section 7.3.4. of this chapter. The layout of the PV facility within the assessed Development Envelope, as shown in Figure 7.2, will avoid the sensitive ecological and heritage features identified by the respective specialists (where possible).

In accordance with the Guideline on Need and Desirability (GN 891 of 2014), this EIA considered the nature, scale and location of the 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). When considering the timing of this project, the IRP2010 proposes to secure 17 800 MW of renewable energy capacity by 2030. As noted in the preceding chapters of this EIA Report, in August 2011, the DOE launched the REIPPPP and invited potential IPPs to submit proposals for the financing, construction, operation and maintenance of the first 3 725 MW of various renewable energy project (including solar and wind).

On a provincial level, the Northern Cape Province is currently facing considerable constraints in the availability and stability of electricity supply. This is a consequence of South Africa's electricity generation and supply system being overstretched, and the reliance of the Northern Cape, as many other South African provinces, on the import of power to service its energy needs. The development of solar energy is 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 does not go against any of the objectives set within the !Kheis Municipality draft IDP 2017/18. The proposed project will be in line with and will be supportive of the IDP's objective of creating more job opportunities. The proposed solar energy facility will assist in local job creation during the construction and operation phases of the project (if approved by the DEA). It should however be noted that employment during construction phase will be temporary. During the operational phase of the project (estimated to be more 20 years), long-term employment opportunities will be created.

The locality of the proposed project will fall within an area that has already been transformed due to the presence of the Sishen-Saldanha ore line, the Eskom Nieuwehoop Substation and Eskom transmission lines that will be constructed within this area. The locality of this project would not have a significant ("high") impact on any sensitive viewers (as determined in the Visual Impact Assessment included in Appendix M of this EIA Report), will not significantly negatively impact on any environmental features (as discussed above), and will have a very low significance negative impact on the current agricultural land use of the site.

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 EIA 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 (as shown in Figures 7.2) and through appropriate monitoring and management plans included in the EMPr (Part B of the EIA Report).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and supporting sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site. The findings of this EIA show that all natural resources will be used in a sustainable manner (i.e. this project is a renewable energy project and the majority of the negative site specific and cumulative environmental impacts are considered to be of low significance with mitigation measures implemented), while the benefits from the project will promote justifiable economic and social development.

In order to ensure the effective implementation of the mitigation and management actions, an EMPr has been compiled and is included in Part B of this Draft EIA Report. The mitigation measures necessary to ensure that the project is planned, constructed, operated and decommissioned in an environmentally responsible manner are listed in this EMPr. The EMPr is a dynamic document that should be updated regularly and provide clear and implementable measures for the establishment and operation of the proposed Solar PV facility.

Taking into consideration the findings of the EIA Process and given the national and provincial strategic requirements for infrastructure development, it is the opinion of the EAP that the project benefits outweigh the costs and that the project will make a positive contribution to steering South Africa on a pathway towards sustainable infrastructure development. Provided that the specified mitigation measures are applied effectively, it is recommended that the project receive EA in terms of the 2014 EIA Regulations (as amended on 7 April 2017) promulgated under the NEMA.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

CHAPTER 8:

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DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDICES

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX A:

Curriculum Vitae of the Environmental Assessment Practitioner

CONTENTS

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Curriculum Vitae of Paul Lochner – Technical Advisor and Quality Assurance (EAPSA) Certified

Name of firm	CSIR
Name of staff	Paul Lochner
Profession	Environmental Assessment and Management
Position in firm	Manager: CSIR Environmental Management Services
Years' experience	24 years
Nationality	South African

Biographical Sketch

Paul Lochner commenced work at CSIR in 1992, after completing a degree in Civil Engineering and a Masters in Environmental Science, both at the University of Cape Town. His initial work at CSIR focused on sediment dynamics and soft engineering applications in the coastal zone, in particular, beach and dune management. He conducted several shoreline erosion analyses and prepared coastal zone management plans for beaches. He also prepared wetland management plans.

As the market for environmental assessment work grew, he led Environmental Impact Assessments (EIAs), in particular for coastal resort developments and large-scale industrial developments located on the coast; and Environmental Management Plans (EMPs), in particular for wetlands, estuaries and coastal developments. He has also been involved in researching and applying higher-level approaches to environmental assessment and management, such as Strategic Environmental Assessment (SEA). In 1998-1999, he coordinated the SEA research programme within the CSIR, which led to him being a lead author of the Guideline Document for SEA in South Africa, published by CSIR and national Department of Environmental Affairs (DEA) in February 2000.

In 1999 and 2000, he was the project manager for the legal, institutional, policy, financial and socio-economic component of the Cape Action Plan for the Environment ("CAPE"), a large-scale multi-disciplinary study to ensure the sustainable conservation of the Cape Floral Kingdom. This was funded by the Global Environmental Fund (GEF) and prepared for WWF-South Africa. The study required extensive stakeholder interaction, in particular with government institutions, leading to the development of a Strategy and Action Plan for regional conservation.

In July 2003, he was certified as an Environmental Assessment Practitioner by the

Interim Certification Board for Environmental Assessment Practitioners of South Africa.

He has authored several guidelines for government. In 2004, he was lead author of the *Overview of IEM* document in the updated Integrated Environmental Management (IEM) Information Series published by national Department of Environmental Affairs and Tourism (DEAT). In 2005, he was part of the CSIR team that prepared the series entitled *Guidelines for involving specialists in EIA processes* for the Western Cape Department of Environmental Affairs and Development Planning (DEADP); and he authored the *Guideline for Environmental Management Plans* published by Western Cape government in 2005. In 2006-2007, he worked closely with the (then) Dept of Minerals and Energy (DME) of South Africa to prepare a Guideline for Scoping, Environmental Impact Assessment and Environmental Management Plans for mining in South Africa.

Over the past 20 years has been closely involved with several environmental studies for industrial and port-related projects in Coega Industrial Development Zone (IDZ), near Port Elizabeth. This included the SEA for the establishment of the Coega IDZ in 1996/7, an EIA and EMP for a proposed aluminium smelter in 2002/3, and assistance with environmental permit applications for air, water and waste. At the Coega IDZ and port, he has also conducted environmental assessments for port development, LNG storage and a combined cycle gas turbine power plant, manganese export, rail development, marine pipelines, and wind energy projects.

Since 2009, he has undertaken numerous EIAs for the renewable energy sector, in particular for wind and solar photovoltaic energy projects. In these EIAs, he has been project leader and integrated the specialist findings from a range of specialist disciplines.

He is currently project leader on two Strategic Environmental Assessments (SEAs) that are being undertaken for national DEA. These SEAs are to support the implementation of the Strategic Integrated Projects (SIPs) that are being promoted by the Presidential Infrastructure Coordinating Committee (PICC). The SEA for Wind and Solar Photovoltaic Energy for South Africa is being conducted over 2013-2014, and the SEA for electricity grid infrastructure commenced January 2014.

Since 2009, Paul has been the manager of the Environmental Management Services (EMS) group within CSIR. This group currently consists of approximately 20 environmental assessment practitioners and a group assistant, with offices in Stellenbosch and Durban. EMS focuses on conducting complex environmental studies in challenging environments, such as remote and data poor regions in Africa (e.g. Cameroon, Gabon, Angola, Namibia and Ethiopia). We also specialise in environmental studies for emerging and innovative technologies, drawing on research and applied scientific expertise within CSIR. Our role is to assist in ensuring the sustainability of projects in terms of environmental and social criteria, by providing a range of environmental services that extend across the project lifecycle, from the pre-feasibility stage through to feasibility, commissioning, operations and closure. We provide this service to government, international agencies, private sector and non-government organisations.

EMPLOYMENT TRACK RECORD

The following table presents a sample of the projects that Paul Lochner has been involved in to this date:

Completion Date	Project description	Role	Client
In progress	**SEA for Aquaculture** Development in South Africa (marine and freshwater)	Project leader	DEA and DAFF
In progress	**SEA for the Square Kilometre Array** radio-telescope in the Karoo, South Africa	Project leader	DEA and DST
2015-2017	**SEA for Shale Gas Development** in South Africa	Project co-leader	Dept of Environmental Affairs (DEA), DMR, DOE, DST, DWS
2015-2016	SEA for the development of **Electrical Grid Infrastructure** for South Africa	Project leader	DEA
2016-2017	EIA for the 75 MW x 12 **solar photovoltaic** energy projects near Dealesville, Free State	Project Leader	Mainstream Renewable Power SA
2014-2015	SEA of **planning** for the far south Cape Peninsula	Project Leader	City of Cape Town
2013-2015	EIA for the Ishwati Emoyeni 140 MW **wind energy project** and supporting electrical infrastructure near Murraysburg, Western Cape	Project Leader	Windlab
2013-2015	EIA for the Saldanha marine outfall **pipeline**	Project Leader	Frontier Saldanha Utilities
2012-2015	SEA for identification of **renewable energy zones** for wind and solar PV projects in South Africa	Project leader	DEA
2012-2013	**Environmental Screening Study for a desalination plant** for the City of Cape Town	Project leader	City of Cape Town & WorleyParsons
2012-2013	EIA for **LNG Import** to the Mossel Bay Gas-to-Liquid refinery (stopped end of Scoping)	Project leader	PetroSA
2012-2013	EIA for the **desalination plant** for the Saldanha area	Project leader	West Coast District Municipality &

Completion Date	Project description	Role	Client
			WorleyParsons
2012-2013	EIA for the **manganese export terminal** at the Port of Ngqura and Coega IDZ	Project leader	Transnet
2011 - 2012	EIA for the **100 MW solar photovoltaic** project proposed by Mainstream Renewable Power at Blocuso, near Keimoes in the Northern Cape	Project leader	Mainstream Renewable Power
2011 – 2012	EIA for the **100 MW solar photovoltaic** project proposed by Mainstream Renewable Power at Roode Kop Farm, near Douglas, in the Northern Cape	Project leader	Mainstream Renewable Power
2011 – 2012	EIA for the 75 MW **solar photovoltaic project** proposed by Solaire Direct at **GlenThorne**, near Bloemfontein in the Free State	Project leader	Solaire Direct
2011 – 2012	EIA for the 75 MW **solar photovoltaic project** proposed by SolaireDirect at **Valleydora**, near Springfontein in the Free State	Project leader	Solaire Direct
2010-2011	More than 10 Basic Assessments (BAs) for **solar photovoltaic projects** in the western cape, Northern Cape, Eastern Cape and Free State	Project leader	Various clients including Dutch, German, French and South African companies
2010/2011	**EIA for the Langerfontein** wind project near Darling, Western Cape.	Project leader	Mr Herman Oelsner, Khwe Khoa
2010/2011	**EIA for a 100 MW wind project at Zuurbron and a 50 MW wind project Broadlands** in the Eastern Cape	Project leader	WindCurrent SA (German-based company)
2010/2011	**EIA for the proposed 143 MW Biotherm wind energy project near Swellendam**, Western Cape, South Africa	Project leader	Biotherm South Africa (Pty) Ltd
2010/2011	**EIA for the proposed InnoWind wind energy projects near Swellendam, Heidelberg, Albertinia and Mossel Bay (totalling approx 210 MW),** Western Cape, South Africa	Project leader	InnoWind South Africa (Pty) Ltd

Completion Date	Project description	Role	Client
2009/2010	**EIA for the proposed Electrawinds wind energy facility** of 45-75 MW capacity in the Coega IDZ, Eastern Cape	Project leader	Electrawinds N.V. (Belgium)
2009/2010	**EIA for proposed 180 MW Jeffreys Bay wind energy project,** Eastern Cape	Project Leader and co-author	Mainstream Renewable Power South Africa
2009/2010	**Basic Assessment for the national wind Atlas for South Africa**	Project leader	SANERI and SA Wind Energy Programme, Dept of Energy
2009/2010	**EIA for the proposed Gecko soda plant,** Otjivalunda and Arandis, Namibia (cancelled)	Project leader	Gecko, Namibia
2009-2010	**EIA for the proposed desalination plant** at Swakopmund, Namibia	Project leader	NamWater, Namibia
2009	**EMP for the Operational Phase of the Berg River Dam**, Franschoek, South Africa	Project leader and report co-author	TCTA, South Africa
2009/2010 *(on hold)*	**EIA for the proposed crude oil refinery** at Coega, South Africa	Project leader and lead author	PetroSA, South Africa
2008	**Environmental Risk Review** for proposed LNG/CNG import to Mossel Bay, South Africa	Project leader and lead author	PetroSA, South Africa
2008	**Review of the Business Plan** for catchment management for the Berg Water Dam Project, Franschhoek, South Africa	Project reviewer and co-author	TCTA, South Africa
2007 – 2010	**EIA for proposed Jacobsbaai Tortoise Reserve eco-development**, Saldanha, Western Cape	Project Leader and co-author	Jacobsbaai Tortoise Reserve (Pty) Ltd
2007 – 2010	**Independent reviewer** for the EIA proposed Amanzi lifestyle development, Port Elizabeth	Independent reviewer appointed to advise EAP	Public Process Consultants and Pam Golding
2007 – 2008	**EIA for proposed 18 MW Kouga wind energy project,** Eastern Cape	Project Leader and co-author	Genesis Eco-Energy (Approved by DEDEA in March 2009)
2007	**Review of EIA for the proposed Hanglip Eco-Development**, Plettenberg Bay, Western Cape	Co-author of review of EIA, undertaken on behalf of DEADP	Dept of Environmental Affairs & Development Planning, Western Cape
2006-2007	**Scoping phase for the EIA for the**	Project Leader and co-author	Eskom and iGas

Completion Date	Project description	Role	Client
	proposed Coega LNG-to-Power Project at the Port of Ngqura, Coega IDZ		
2006-2007	**Guideline** for Scoping, Environmental Impact Assessment and Environmental Management Plans for mining in South Africa	Project leader and co-author	Dept of Minerals and Energy (DME), South Africa
2006	**Environmental Impact Assessment (EIA)** for the extension of the Port of Ngqura, Eastern Cape	Project Leader and co-author	Transnet
2006	**Integrating Sustainability Into Strategy: Handbook** (Version 1)	Project Leader and co-author	CSIR (STEP research report)
2005	**Technology Review** for the proposed aluminium smelter at Coega, South Africa	Project Leader and lead author	Alcan, Canada
2005	**Environmental and Social Impact Assessment (ESIA) report** for the proposed alumina refinery near Sosnogorsk, Komi Republic, Russia	Project manager and co-author	Komi Aluminium, Russia, IFC, EBRD
2005	**Guideline for Environmental Management Plans (EMPs)** for the Western Cape province, including conducting a training course for provincial government	Author	Dept of Environmental Affairs & Development Planning, Western Cape
2005	**Guideline for the review of specialist studies** undertaken as part of environmental assessments	Member of Steering Committee and project facilitator	Dept of Environmental Affairs & Development Planning, Western Cape
2004	**Review of Strategic Management Plan** for Table Mountain National Park (2001-2004)	Reviewer and co-author	South African National Parks
2004	**Strategic Needs Assessment Process** for mainstreaming sustainable development into business operations	Researcher and co-author	CSIR (internal research)
2004	**Environmental Monitoring Committees** booklet in the IEM Information Series for DEAT	Contributing author	Department of Environmental Affairs and Tourism (DEAT)
2004	**Overview of Integrated Environmental Management** (IEM) booklet in the IEM	Lead author and researcher	DEAT

Completion Date	Project description	Role	Client
	Information Series		
2003	**Environmental Screening Study** for gas power station, South Africa	Project Manager and lead author	Eskom, iGas and Shell
2003	**Environmental Management Programme** (EMP) Framework for the proposed Coega Aluminium Smelter; and assistance with preparing permit and licence applications	Project Manager and lead author	Pechiney, France
2003	**Environmental Management Plan** for the Operational Phase of the wetlands and canals at Century City, Cape Town	Project leader and lead author	Century City Property Owners' Association
2002	**Environmental Impact Assessment** for the proposed Pechiney aluminium smelter at Coega, South Africa	Project Manager and lead author	Pechiney, France
2002 - 2003	**Research project:** Ecological impact of large-scale groundwater abstraction on the Table Mountain Group aquifer	Project Manager	Water Research Commission
2002	**Environmental Management Plan** for the Eskom Wind Energy Demonstration Facility in the Western Cape	Co-author	Eskom
2001-2002	**Environmental Impact Assessment** for the Eskom Wind Energy Demonstration Facility in the Western Cape	Quality control & co-author	Eskom
2001	**Environmental Due Diligence** study of four strategic oil storage facilities in South Africa	Project manager and co-author	SFF Association
2000	**Cape Action Plan for the Environment**: a biodiversity Strategy and Action Plan for the Cape Floral Kingdom - legal, institutional, policy, financial and socio-economic component	Project manager and contributing writer	World Wide Fund for Nature (WWF): South Africa
1999	**Environmental Management Plan** for the establishment phase of the wetlands and canals at Century City, Cape Town	Project manager and lead author	Monex Development Company
1999	**Environmental Management Programme** for the Thesen	Process design and Co-author	Chris Mulder Associates Inc; Thesen

Completion Date	Project description	Role	Client
	Islands development, Knysna		and Co.
1999	**Management Plan** for the coastal zone between the Eerste and Lourens River, False Bay, South Africa	Project manager and lead author	Heartland Properties and Somchem (a Division of Denel)
1998	**Environmental Assessment** of the Mozal Matola Terminal Development proposed for the Port of Matola, Maputo, Mozambique	Project manager and author.	*SNC-Lavalin-EMS*
1998	**Strategic Environmental Assessment (SEA)** for the Somchem industrial complex at Krantzkop, South Africa	Project manager and co-author	Somchem, a Division of Denel
1997	**Strategic Environmental Assessment (SEA)** for the proposed Industrial Development Zone and Harbour at Coega, Port Elizabeth, South Africa	SEA project manager and report writer	Coega IDZ Initiative Section 21 Company
1996	**Environmental Impact Assessment** of Development Scenarios for Thesen Island, Knysna, South Africa	Project manager and report writer	Thesen and Co.
1996	**Environmental Impact Assessment** of the Management Options for the Blouvlei wetlands, Cape Town	Project manager and report writer	Ilco Homes Ltd (now Monex Ltd)
1995	**Environmental Impact Assessment** for the Saldanha Steel Project, South Africa	Report writing and management of specialist studies	Saldanha Steel Project
1994	**Environmental Impact Assessment** for the upgrading of resort facilities on Frégate Island, Seychelles	Member of the project management team, co-author, process facilitator	Schneid Israelite and Partners
1994	**Environmental Impact Assessment** for exploration drilling in offshore Area 2815, Namibia	Project manager and co-author	Chevron Overseas (Namibia) Limited
1994	**Management Plan** for the Rietvlei Wetland Reserve, Cape Town	Project manager and lead author	Southern African Nature Foundation (now WWF-SA)
1993	**Beach management plan** for Stilbaai beachfront and dunes, South Africa	Project manager and lead author	Stilbaai Municipality

Completion Date	Project description	Role	Client
1993	**Beach and dune management plan for Sedgefield** for the beach east of the mouth of the Swartvlei estuary	Project manager and lead author	Nel and De Kock Planners, George
1993	**Coastal Stability analysis and beach management plan** for the Table View coastline north of Blaauwberg Road, Cape Town	Project manager and lead author	Milnerton Municipality

EMPLOYMENT RECORD

- **1992 to present** Involved in coastal engineering studies; and various forms of environmental assessment and management studies. Council for Scientific and Industrial Research – Environmental Management Services (EMS) - Stellenbosch

QUALIFICATIONS/EDUCATION

- M. Phil. Environmental Science (University of Cape Town)
- B.Sc. Civil Engineering (awarded with Honours) (University of Cape Town)

LANGUAGE CAPABILITY

LANGUAGES	***Speaking***	***Reading***	***Writing***
English	Excellent	Excellent	Excellent
Afrikaans	Moderate	Moderate	Moderate

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Curriculum Vitae of Surina Laurie – Project Leader (*Pr. Sci. Nat.*)

Name of firm	CSIR
Name of staff	Surina Laurie
Profession	Environmental Assessment Practitioner
Position in firm	Project Manager/Senior Environmental Assessment Practitioner
Years' experience	6 years
Nationality	South African

Biographical Sketch

Surina has more than 6 years' experience as an Environmental Assessment Practitioner (EAP). She completed both her BSc in Conservation Ecology and MPhil in Environmental Management (part-time) at the University of Stellenbosch. With her honours project, she worked closely with the Endangered Wildlife Trust Riverine Rabbit Working Group and was responsible for determining the conservation opportunity for the Riverine Rabbit in the Karoo. With this project, she gained valuable experience in how to interact and manage stakeholders in such a way that a project's objectives and conservation goals are met without the stakeholders not being included in the decision-making process. The management of stakeholders and the ability to incorporate and/or adequately reflect their input are considered to be an essential component of an Environmental Impact Assessment (EIA) process.

With her Masters' thesis she researched and addressed why there is a need to undertake a Cost Benefit Analysis (CBA) as part of any EIA. The need for a CBA stems from the fact that losing environmental services will have an economic impact on a regional/national level in the long term but this is usually not considered during an EIA process. A CBA will look at both the economic benefits (profit) from a project and the economic losses because of loss of ecosystem services or rehabilitation costs. By including a CBA in an EIA, both the economic and environmental financial implications (not just the environmental significance of an impact) of a project will be considered by the decision making authority prior to the issuing of Environmental Authorisations or permits. To further expand her knowledge in this field, she has recently obtained a Postgraduate Certificate in Environmental Economics from the University of London.

She has experience as a project manager and project leader for Basic Assessments and Scoping and Environmental Impact Assessments for various sectors, including renewable energy, industry and tourism.

EMPLOYMENT TRACK RECORD

The following table presents a sample of the projects that Surina Laurie has been involved in to this date:

Completion Date	Project description	Role	Client
2016-present	Strategic Environmental Assessment for the effective and efficient roll-out of large scale wind and solar energy projects in South Africa (Phase 2)	Project Manager	Department of Environmental Affairs
2016	Environmental Screening Study for the potential development of two Solar PV projects in the North West Province	Project Manager	Veroniva
2016	Basic Assessment process for the proposed construction of supporting electrical infrastructure to the Victoria West Wind Energy Facility, Victoria West, Northern Cape	Project Manager	South Africa Mainstream Renewable Power Developments (Pty) Ltd
2016	Amendment application to the Victoria West renewable energy facility in order to add additional wind turbines to site, Victoria West, Northern Cape	Project Manager	South Africa Mainstream Renewable Power Developments (Pty) Ltd
2015 - 2016	Scoping and Environmental Impact Assessment for 3 x 75 MW Solar PV facilities and associated electrical infrastructure near Kenhardt, Northern Cape a	Project Leader	Mulilo Renewable Project Development (Pty) Ltd
2015 - 2016	Scoping and Environmental Impact Assessment for 5 x 100 MW Solar PV facilities near Dealesville, Free State.	Project Leader	29Solar Capital
2015	Review of the validity of the appeals received against the EA issued for the construction of an 11 MW Hydro Power Station, Groblershoop, Northern Cape Province	Project Manager	Department of Environmental Affairs
2014 -2016	Integrated Scoping and EIA process for the development of twelve (12) Photovoltaic (PV) or Concentrated Photovoltaic (CPV) Solar Facilities with a generating capacity of 75 MW/100 MW each, near Dealesville, Free State.	Project Manager	South Africa Mainstream Renewable Power Developments (Pty) Ltd
2014 - 2015	Integrated Scoping and EIA process for the construction of three Photovoltaic (PV) or Concentrated Photovoltaic (CPV)	Project Manager	Mulilo Renewable Project Development (Pty) Ltd

Completion Date	Project description	Role	Client
	Solar Facilities with a generating capacity of 75 MW each on the farms remaining extent of Portion 3 of the Farm Gemsbok Bult 120 and Boven Rugzeer remaining extent of 169, located 30 km north-east of Kenhardt. Two of the projects will be located on the farm remaining extent of Portion 3 of the Farm Gemsbok Bult 120 and one on Boven Rugzeer remaining extent 169.		
2013-2014	Basic Assessment for the construction of three additional petroleum storage tanks at the Cape Town Harbour.	Environmental Consultant	FFS Refiners (Pty) Ltd
2013-2014	Scoping and EIA for the construction of a Sewage Package Plant on Robben Island.	Environmental Consultant	Department of Public Works
2013	Development of an EMPr for the undertaking of maintenance work on the Stilbaai Fishing Harbour's Slipway located in Stilbaai, Western Cape, South Africa. In order to be compliant to the requirements of the National Environmental Management Act (Act 107 of 1998) and Environmental Impact Assessment (EIA) Regulations, a Maintenance Management Plan (MMP) needed to be developed to manage the environmental impacts associated with maintenance work that is scheduled to be undertaken on the Stilbaai Fishing Harbour's Slipway as well as any future on-going maintenance requirements.	Environmental Consultant	Department of Public Works
2012-2014	Waste Management License for the proposed storage of Ferrous HMS 1+2, Shredded Ferrous and Bales located at the K/L Berth at Duncan Road, Port of Cape Town	Environmental Consultant	The New Reclamation Group (Pty) Ltd
2012-2014	Scoping and EIA for the construction a biodiesel refinery in the Coega Industrial Development Zone (IDZ). The proposed project entails the import of used vegetable oil from the USA and converting it through	Environmental Consultant	FIS Biofuels (Ltd)

Completion Date	Project description	Role	Client
	various processes to biodiesel which will be exported to Europe. The proposed project requires an Air Emissions License, a Waste Management License and Environmental Authorisation.		
2013-2013	Basic Assessment for the proposed redevelopment of Berths B, C and D in Duncan Dock at the Port of Cape Town.	Assistant Environmental Consultant	FPT (Pty) Ltd
2011- 2012	Development of an EMPr for the Eerstelingsfontein Opencast Project (EOP).	Assistant Environmental Consultant	Exxaro Resources Limited
2011-2014	Basic Assessment for the proposed reinstatement of the Blue Stone Quarry located on Robben Island.	Assistant Environmental Consultant	Department of Public Works
2011	Scoping and EIA for the proposed upgrade to the Struisbaai WWTW.	Assistant Environmental Consultant	Cape Agulhas Municipality
2011	Basic Assessment for the construction of a cellular mast.	Environmental Consultant	MTN (Pty) Ltd
2010-2011	Basic Assessment for the construction of a Heritage Centre.	Environmental Consultant	Waenhuiskrans Arniston Community Development Trust
2010-2011	Scoping and EIA for the rezoning of the area from open space to residential, the construction of six residential units and the upgrading of the existing Waste Water Treatment Plant.	Environmental Consultant	Private developer

EMPLOYMENT RECORD

- **2014 to present** Project Manager- Environmental Assessment Practitioner. Council for Scientific and Industrial Research – Environmental Management Services (EMS) - Stellenbosch
- **2011 to 2014** Environmental Consultant. WSP Environmental (Pty) Ltd - Gauteng
- **2010 to 2011** Junior Environmental Consultant - Somerset West

QUALIFICATIONS/EDUCATION

- Postgraduate Certificate Environmental Economics (University of London)
- Project Management Course (University of Cape Town Graduate School of Business)
- MPhil Environmental Management (University of Stellenbosch)
- BSc Conservation Ecology (University of Stellenbosch)

LANGUAGE CAPABILITY

LANGUAGES	***Speaking***	***Reading***	***Writing***
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

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Curriculum Vitae of Kelly Stroebel – Project Manager (*Cand. Sci. Nat.)*

Name of firm	CSIR
Name of staff	Kelly Stroebel
Profession	Environmental Assessment Practitioner
Position in firm	Environmental Assessment Practitioner
Years' experience	4 years
Nationality	South African

Biographical Sketch

Kelly holds a Bachelor of Science with Honours in Environmental Science from Rhodes University in Grahamstown and is currently pursuing a Masters at the University of Stellenbosch. Her undergraduate degree was a Bachelor of Science with majors in Environmental Science and Zoology. She is currently working as an environmental assessment practitioner at the Council for Scientific and Industrial Research (CSIR). Kelly has been the Project Manager of several EIA's in South Africa and several Basic Assessments for the Special Needs and Skills Development Programme. She has assisted in the SIP projects including the National Wind & Solar Strategic Environmental Assessment (SEA) and Electricity Grid Infrastructure SEA as SEA which were commissioned by the national Department of Environmental Affairs. On a personal level, Kelly enjoys the outdoors, traveling and SCUBA diving and is passionate about the field of environmental science and management.

EMPLOYMENT TRACK RECORD

The following table presents a sample of the projects that Kelly Stroebel has been involved in to this date:

Completion Date	Project description	Role	Client
In progress	**EIA's in the South African energy sector**	Project Manager/EAP	Private energy companies and organs of state
In progress	**Special Needs and Skills Development Programme (DEA-CSIR)**	Project Manager conducting Environmental services such as basic Assessments and Environmental Screening Studies.	Various SMME's and Community Trusts
2015	**Strategic Environmental Assessment (SEA)** for Electricity	Project member-stakeholder engagement and project support.	National Department of Environmental

Completion Date	Project description	Role	Client
	Grid Infrastructure		Affairs
2015	**EIA for two proposed Desalination plants on the KZN coast.**	Project member- Public Participation Process, stakeholder engagement and project support.	Umgeni Water
August 2014	**National Strategy for Sustainable Development Review (NSSD1)**	Project member- research and report development.	National Department of Environmental Affairs
2013-2014	**Strategic Environmental Assessment (SEA)** for roll out of photovoltaic solar and wind energy in South Africa.	Project member- Stakeholder engagement and project support	National Department of Environmental Affairs

EMPLOYMENT RECORD

- **2015 to present** Environmental Scientist and Assessment Practitioner. Council for Scientific and Industrial Research – Consulting and Analytical Services (CAS) - Stellenbosch
- **2014** Environmental Scientist and Assessment Practitioner (Intern). Council for Scientific and Industrial Research – Consulting and Analytical Services (CAS) - Stellenbosch
- **2013** Environmental Education Counselor - Fernwood Cove Summer Camp, USA.
- **2012** Graduate Assistant: Rhodes University Department of Environmental Science.
- **2011** Vacation Internship: Environmental Management Department of Mittal Steel, Newcastle.
- **2011** Vacation Internship: Northern Kwa-Zulu Natal branch of WWF.

QUALIFICATIONS/EDUCATION

- BSc Hons. Environmental Science (Rhodes University, Grahamstown, South Africa)
    - Honours modules including Environmental Impact Assessment, Statistics, Climate Change Adaptation, Urban Ecology and Environmental Water Quality.
    - Honours thesis: “Water use and conservation by households of different economic status in King Willliam’s Town”
- Bachelor of Science with Distinction (Rhodes University, Grahamstown, South Africa)
    - Undergraduate courses including Environmental Science, Zoology, Ichthyology, Chemistry, Earth Science, Botany and Computer Science.
- IEB Matric Certificate, 5 Distinctions (St Dominic’s Academy, Newcastle)

TRAINING, CONFERENCES AND PROFFESIONAL REGISTRATIONS

- Member of the Conference Organizing Committee (COC) for the IAIAsa Annual Conference 2017
- Project Management Practices and Principles with MS projects with the University of Pretoria: Distinction obtained (2016)
- Introduction to Earth Observation using ENVI with the University of Stellenbosch (2016)
- Public Participation Course with IAP2 (2016)
- Conflict Management Accredited through Conflict Dynamics (2015)
- Media and Science Training Accreditation through Jive Media Africa (2015)
- IAIA WC Workshop for Integrating Climate Change into EIA practice (2015)
- Presented on the DEA-CSIR “Special Needs and Skills Development Programme” at the 2014 & 2015 Annual IAIA (International Association for Impact Assessment) South Africa Conference.

- Environmental Impact Assessment Training Course accreditation through Coastal and Environmental Services, Grahamstown (2012)
- DEA&DP Training on the EIA Regulations (2014)
- Registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) (Reg #: 100151/14)
- Member of the South African Affiliate of the International Association for Impact Assessment (Membership no: 3588)

LANGUAGE CAPABILITY

LANGUAGES	***Speaking***	***Reading***	***Writing***
English	Excellent	Excellent	Excellent
Afrikaans	Moderate	Moderate	Moderate

CSIR
Jan Cilliers Street
PO Box 320
Stellenbosch 7600
South Africa

Phone: +27 21 888 2432
Fax: +27 21 888 2693
Email: bmqokeli@csir.co.za

Curriculum Vitae of Babalwa Mqokeli – Project Manager (*Cand. Sci. Nat.)*

Name of firm	CSIR
Name of staff	Babalwa Mqokeli
Profession	Environmental Assessment Practitioner
Position in firm	Junior Environmental Assessment Practitioner
Years' experience	2 years
Nationality	South African

Biographical Sketch

Babalwa holds a Masters degree in Ecological Science from the University of KwaZulu-Natal. She has 2 years of experience in the environmental management field, as an ecological scientist. She is currently working as an environmental assessment practitioner at the Council for Scientific and Industrial Research (CSIR). Babalwa has been a Project Manager for a variety of Basic Assessment projects in the mining and agricultural sector, under the DEA-CSIR Special Needs and Skills Development Programme. She is currently assisting in a solar energy EIA, as a Project Officer. Babalwa is passionate about environmental management and planning.

EMPLOYMENT TRACK RECORD

The following table presents a sample of the projects that Babalwa Mqokeli has been involved in to this date:

Completion Date	Project description	Role	Client
In progress	**EIA's in the South African energy sector**	Project member	Private energy companies and organs of state
In progress	**Special Needs and Skills Development Programme (DEA-CSIR)**	Project Manager conducting Environmental services such as basic Assessments and Environmental Screening Studies for agricultural and mining projects.	Various SMME's and Community Trusts
In progress	**Strategic Environmental Assessment (SEA)** for Renewable Energy Development Zones	Project member-stakeholder engagement and project support.	National Department of Environmental Affairs
In progress	**Permit Application Process for *Boscia albitrunca* (Shepherd's Tree)**	Project member	North West Department of Economic and Enterprise Development

EMPLOYMENT RECORD

- **2017 to present** Environmental Assessment Practitioner. Council for Scientific and Industrial Research – Environmental Management Services (EMS) Unit - Stellenbosch
- **2015** Environmental Assessment Practitioner (Intern). Council for Scientific and Industrial Research – Environmental Management Services (EMS) Unit - Stellenbosch
- **2015** Biology 101 Teacher Assistant. University of KwaZulu-Natal - Pietermaritzburg
- **2013** Conservation Research Intern. Nature's Valley Trust (WWF-SA Environmental Leaders Programme) - Plettenberg Bay.

QUALIFICATIONS/EDUCATION

- MSc Ecological Science (University of KwaZulu-Natal, Pietermaritzburg, South Africa)
- BSc Hons. Ecological Science (University of KwaZulu-Natal, Pietermaritzburg, South Africa)
- BSc Biological Science (University of Zululand, Empangeni, South Africa)
    - Undergraduate courses including Integrated Environmental Management, Aquatic Conservation & Management, Animal Ecology (Terrestrial, Freshwater & Marine), Risk Assessment & Ecotoxicology, Environmental Law & Waste Management, Introduction to Surface Water Hydrology, Botany.
- Matric Certificate (Durban Girls' Secondary School, Durban)

LANGUAGE CAPABILITY

LANGUAGES	***Speaking***	***Reading***	***Writing***
English	Excellent	Excellent	Excellent
IsiXhosa	Excellent	Excellent	Excellent
IsiZulu	Excellent	Excellent	Excellent
Afrikaans	Poor	Moderate	Moderate

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX B:

Declaration of the Environmental Assessment Practitioner

APPENDIX 9
DECLARATION OF THE EAP

I, Kelly Stroebel declare that –

General declaration:

- I act as the independent environmental practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in regulation 8 of the Regulations when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process; and
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this form are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I realise that a false declaration is an offence in terms of regulation 48 of the Regulations and is punishable in terms of section 24F of the Act.

33

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;
- ~~I have a vested interest in the proposed activity proceeding, such vested interest being:~~

Signature of the environmental assessment practitioner:

CSIR

Name of company:

15/09/2017

Date:

34

APPENDIX 9

9.2 UNDERTAKING UNDER OATH/ AFFIRMATION

I, Kelly Stroebel, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the environmental assessment practitioner

CSIR

Name of company

15/09/2017

Date

BRANCH MANAGER

2017 -09- 15

7599 STELLENBOSCH

TAKBESTUURDER

"I certify that the DEPONENT has acknowledged that he/she knows and understands the contents of this affidavit, that he/she does not have an objection to taking the oath, and that he/she considers it to be binding on his/her conscience, and which was sworn to and signed before me and that the administering oath complied with the regulations contained in Government Gazette No. R 1258 of 21 July 1972, as amended.

SIGNATURE

FULL NAMES Antoinette Kobe

Commissioner of Oaths

Designation: BRANCH MANAGER ex officio: Republic of South Africa

Date: 15/9/17

Place: Stellenbosch

Business Address: Cnr Bird, Plein Str Stellenbosch.

35

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX C:

Database of Interested and Affected Parties

Number	First Name	Surname	Company/ Organisation	Notice of Project Announcement and Release of Draft Scoping Reports	Email: Notice of Submission of Scoping Reports to DEA	Notice of Release of Draft EIA Reports and BA Report	Email: Notice of Submission of EIA Reports and BA Report to DEA	Notice of EA for BAs and EIAs
Organs of State								
1.	Mmatlala	Rabothatha	National DEA: Integrated Environmental Authorisations	✓	✓			
2.	Muhammad	Essop	National DEA: Integrated Environmental Authorisations	✓	✓			
3.	Wilma	Lutsch	National DEA: Biodiversity and Conservation	✓	✓			
4.	Skumsa	Mancotywa	National DEA: Protected Areas Unit		✓			
5.	Herman	Alberts	National DEA: Integrated Environmental Authorisations	✓	✓			
6.	A	Yaphi	Provincial Department of Environment and Nature Conservation (DENC): Northern Cape	✓	✓			
7.	M	Mathews	Provincial DENC: Northern Cape	✓	✓			
8.	Samantha	De la Fontaine	Provincial DENC: Northern Cape	✓	✓			
9.	Elsabe	Swart	Provincial DENC: Northern Cape	✓	✓			
10.	Sibonelo	Mbanjwa	Provincial DENC: Northern Cape	✓	✓			
11.	Luzane	Tools-Bernado	Provincial DENC: Northern Cape	✓	✓			
12.	Eric	Ngxanga	ZF Mgcawu District Municipality - Municipal Manager	✓	✓			
13.	Frikkie	Ruping	ZF Mgcawu District Municipality - Environmental Manager	✓	✓			
14.	H.T	Scheepers	!Kheis Municipality - Municipal Manager	✓	✓			
15.	Gloria	Matlakala	!Kheis Municipality	✓	✓			

Number	First Name	Surname	Company/ Organisation	Notice of Project Announcement and Release of Draft Scoping Reports	Email: Notice of Submission of Scoping Reports to DEA	Notice of Release of Draft EIA Reports and BA Report	Email: Notice of Submission of EIA Reports and BA Report to DEA	Notice of EA for BAs and EIAs
16.	JG	Lategan	Kai ! Garib Municipality - Municipal Manager	✓	✓			
17.	M.	Clarke	Kai ! Garib Municipality - Manager: Electromechanical Services	✓	✓			
18.	Mashudu	Randwedzi	Department of Water and Sanitation	✓	✓			
19.	Melinda	Mei	Department of Water and Sanitation	✓	✓			
20.	Shaun	Cloete	Department of Water and Sanitation	✓	✓			
21.	Chantèl	Schwartz	Department of Water and Sanitation	✓	✓			
22.	Mandla	Ndzilili	Ministry of Environment and Nature Conservation	✓	✓			
23.	Mashudu	Marubini	National Department of Agriculture, Forestry and Fisheries (DAFF)	✓	✓			
24.	Thoko	Buthelezi	National DAFF - AgriLand Liaison office	✓	✓			
25.	D	Nhlakad	National DAFF - AgriLand Liaison office	✓	✓			
26.	Anneliza	Collett	National DAFF - AgriLand Liaison office	✓	✓			
27.	H. J.	Buys	National DAFF (Land Use and Soil Management)	✓	✓			
28.	Jacoline	Mans	Provincial DAFF	✓	✓			
29.	Khuthala	D.	DAFF	✓	✓			
30.	Ali	Diteme	Provincial Department of Agriculture, Land Reform & Rural Development	✓	✓			
31.	Pieter	Buys	National Energy Regulator of South Africa	✓	✓			
32.	IA	Bulane	Department of Public Works, Roads and Transport	✓	✓			
33.	Denver	Van Heerden	Department of Public Works, Roads and Transport	✓	✓			
34.	Rene	de kock	South African Roads Agency Limited - Northern Cape (Western Region)	✓	✓			

Number	First Name	Surname	Company/ Organisation	Notice of Project Announcement and Release of Draft Scoping Reports	Email: Notice of Submission of Scoping Reports to DEA	Notice of Release of Draft EIA Reports and BA Report	Email: Notice of Submission of EIA Reports and BA Report to DEA	Notice of EA for BAs and EIAs
35.	Nicole	Abrahams	South African Roads Agency Limited (Western Region)	✓	✓			
36.	M	Lepheane	Department of Labour	✓	✓			
37.	A	Botes	Department of Social Development	✓	✓			
38.	Riaan	Warie	Northern Cape Economic Development Agency	✓	✓			
39.	Andrew	Timothy	Directorate Heritage, Department - Sports, Arts and Culture	✓	✓			
40.	Lizell	Stroh	South African Civilian Aviation Authority	✓	✓			
41.	John	Geeringh	ESKOM	✓	✓			
42.	Kevin	Leask	ESKOM	✓	✓			
43.	Justine	Wyngaardt	ESKOM (Western Operating Unit, Distribution)	✓	✓			
44.	Lindi	Haarhoff	ESKOM (Nieuwehoop Substation)	✓	✓			
45.	Sharon	Steyn	Northern Cape Chamber of Commerce and Industry	✓	✓			
46.	P.J.J	van Rensburg	Agri Northern Cape	✓	✓			
47.	H.	Myburgh	Agri Northern Cape	✓	✓			
48.	Adrian	Tiplady	SKA SA	✓	✓			
49.	Marina	Lourens	Transnet Freight Rail	✓	✓			
50.	Gilbert	Nortier	Transnet Freight Rail	✓	✓			
51.	Mayvyn	Bhana	Transnet	✓	✓			
52.	Clive	Stephenson	Transnet	✓	✓			
53.	Director		Department of Energy Northern Cape	✓	✓			

Number	First Name	Surname	Company/ Organisation	Notice of Project Announcement and Release of Draft Scoping Reports	Email: Notice of Submission of Scoping Reports to DEA	Notice of Release of Draft EIA Reports and BA Report	Email: Notice of Submission of EIA Reports and BA Report to DEA	Notice of EA for BAs and EIAs
54.	Ragna	Redelstorff	South African Heritage Resources Agency[1]	✓	✓			
55.	Natasha	Higgitt	South African Heritage Resources Agency	✓	✓			
56.	Kgauta	Mokoena	Department of Mineral Resources	✓	✓			
57.	Elliot	Sibeko	Department of Telecommunication & Postal Services	✓	✓			
58.	Director		Department of Communications	✓	✓			
59.	Chris	Coetzee	Southern African Large Telescope (SALT) Sutherland	✓	✓			
60.	Raoul	Van den Berg	Southern African Large Telescope (SALT) Sutherland	✓	✓			
Stakeholders (NGOs and Conservation Organisations)								
61.	Simon	Gear	Birdlife South Africa	✓	✓			
62.	Janine	Goosen	Birdlife South Africa	✓	✓			
63.	Lubabalo	Ntsolo	C.A.P.E. Co-ordination Unit: Northern Cape	✓	✓			
64.	Freyni	du Toit	Grasslands Society of Southern Africa	✓	✓			
65.			Endangered Wildlife Trust, Wildlife and Energy Programme	✓	✓			
66.	Dr. Howard	Hendricks	South African National Parks - Snr GM: Policy & Governance Conservation Services Division	✓	✓			
67.	Dr. Joh R	Henschel	SAEON Arid Lands Node	✓	✓			
68.	Praneel	Ruplal	Independent Communications Authority of South Africa (ICASA)	✓	✓			

[1] Note that submissions to the South African Heritage Resources Agency (SAHRA) have been made via the online SAHRIS. The details provided are those of the designated case officer assigned to the application.

Number	First Name	Surname	Company/ Organisation	Notice of Project Announcement and Release of Draft Scoping Reports	Email: Notice of Submission of Scoping Reports to DEA	Notice of Release of Draft EIA Reports and BA Report	Email: Notice of Submission of EIA Reports and BA Report to DEA	Notice of EA for BAs and EIAs
Landowner/Adjacent Landowners								
69.	P	Karsten	Landowner	✓	✓			
70.	D	Strauss	Landowner	✓	✓			
71.	H	Van Wyk	Landowner	✓	✓			
Additional I&APs								
72.	Mitchell	Hodgson	Scatec Solar	✓	✓			
73.	Claude	Bosman	Veroniva (PTY) Ltd - Renewable Energy	✓	✓			
74.	Karen	Low	Mulilo Renewable Energy Developments	✓	✓			

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX D:

Copy of Newspaper Advertisements

NEWSPAPER ADVERTISEMENT – THE GEMSBOK

KENNISGEWING VAN OMGEWINGSIMPAKEVALUERINGPROSESSE VIR DIE ONTWIKKELING VAN DRIE FOTOVOLTAïSE SONKRAGAANLEGTE EN GEASSOSIEERDE ELEKTIESE INFRASTRUKTUUR, NOORD-OOS VAN KENHARDT IN DIE NOORD-KAAP

Kennis word hierdeur gegee in terme van die NEMA Omgewings Impak Asseserings (EIA) Regulasies onder sub-regulasie 41 (2) (a) gepromulgeer in Staatskoerant No. 40772 van 7 April 2017 van die Nasionale Wet op Omgewingsbestuur (Wet 107 van 1998, soos gewysig) (NEMA), dat juwi Renewable Energies' (Pty) Ltd (die Aansoeker) van voorneme is om drie fotovoltaïese (FV) sonkragaanlegte met ŉ opwekkingsvermoë van 100 MW elk en elektriese infrastruktuur op te rig naby Kehardt in die Noord Kaap. Die elektirese komponent sal geassesseer word as deel van 'n aparte Basiese Bestekopname Proses. Die voorgestelde fasiliteite sal opgerig word op Gedeeltes 0 van Smutshoek Plaas 395 en Gedeelte 9 van Gemsbok Bult Plaas 120, geleë ongeveer 43 km noord oos van Kenhardt. Die voorgestelde kraglyne (132 kV kraglyn vir elke 100 MW sonkrag fasiliteit) sal aansluit by die Nieuwehoop Substasie.

In terme van die Nasionale Wet op Omgewingsbestuur (Wet 107 van 1998, soos gewysig) (NEMA) en die NEMA Omgewings Impak Asseserings (EIA) Regulasies gepromulgeer in Staatskoerant No. 40772 en Staatskennisgewing (GNR) 324 en 327 op 7 April, vereis die beoogde projekte dat Omvangsbepaling-en Omgewingsevaluering (OIE) prosesse onderneem moet word sowel as 'n aparte Basiese Bestekopname proses vir die kraglyne.

Die Wetenskaplike en Nywerheidsnavorsingsraad (WNNR) is deur juwi aangestel om die vereiste prosesse te onderneem.

U word hiermee genooi om as ŉ belangstellende en/of geaffekteerde party te registreer **(teen nie later as 23 Oktober 2017 nie)**. Dit sal ons in staat stel om u op ons projek databasis by te voeg en ook sodat u enige kommentaar of kwelpunte aangaande die projek kan opper. Hierdie kommentaar sal by die Omvangsbepalingsverslag en Basiese Bestekopname verslag ingesluit word.

Vir verdere inligting en/of om as ŉ belangstellende en geaffekteerde party te registreer, kontak:

Ms Kelly Stroebel (Omgewings Impak Asseserings Konsultant van WNNR (CSIR)

Posadres: Posbus 320, Stellenbosch, 7599 // **Tel**:(021) 888 2432//**Faks**:(021) 888 2693//

e-pos: kstroebel@csir.co.za

6 OKTOBER 2017 DIE GEMSBOK BLADSY 19

'Vrye onderrig, toegeruste onderwysers' hoeksteen van onderwys

GEMSBOK-UPINGTON: Vanjaar se viering van Wêreldonderwysersdag het "Vrye onderrig, toegeruste onderwysers" as tema, met die fokus op die institusionele outonomie en akademiese vryheid van onderwysers.

Ek Praat Prontuit

Deur Mérie Scheepers

Is dit te veel gevra?

GEMSBOK-UPINGTON: As 'n mens deur Upington ry, sal jy maklik sê dit is 'n mooi dorp. Die paaie in die middedorp is sonder slaggate en die grasperke van die parke is skoon en netjies met lopende sproeiers en 'n mens is al die tyd bewus daarvan dat ons langs die rivier woon.

KENNISGEWING VAN OMGEWINGSIMPAKEVALUERINGPROSESSE VIR DIE ONTWIKKELING VAN DRIE FOTOVOLTAÏSE SONKRAGAANLEGTE EN GEASSOSIEERDE ELEKTRIESE INFRASTRUKTUUR, NOORD-OOS VAN KENHARDT IN DIE NOORD-KAAP

juwi CSIR

Note from the CSIR: The Gemsbok is a weekly Afrikaans newspaper which is distributed every Wednesday and made available from Wednesday to Friday; it is dated for a Friday (in this case, 6 October 2017).

ENGLISH TRANSLATION OF NEWSPAPER ADVERTISMENT ABOVE

NOTICE OF BASIC ASSESSMENT AND SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESSES

THE PROPOSED DEVELOPMENT OF THREE SOLAR PHOTOVOLTAIC FACILITIES AND ASSOCIATED ELECTRICAL INFRASTRUCTURE, NORTH-EAST OF KENHARDT, NORTHERN CAPE PROVINCE

Notice is given in terms of the Environmental Impact Assessment (EIA) Regulations, under sub-regulation 41 (2) (a), published in Government Gazette (GG) No 40772 of 7 April 2017, of the National Environmental Management Act 1998 (Act No. 107 of 1998, as amended) (NEMA), that juwi Renewable Energies' (Pty) Ltd (hereinafter referred to as "juwi") proposes to construct and operate 3 x 100 Megawatt (MW) Solar Photovoltaic (PV) Facilities and associated electrical infrastructure (subject to a separate Basic Assessment Process) near Kenhardt in the Northern Cape Province. The proposed Facilities will be constructed on two land portions, namely Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult Farm 120, located approximately 43 km north-east of Kenhardt. The proposed Solar Facilities will be connected to the Nieuwehoop Substation via a 132 kV transmission line for each 100 MW Facility.

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the NEMA EIA Regulations published in Government Notice Regulation (GNR) 324 and 327 on 7 April 2017 Government Gazette No 40772, the proposed projects require full Scoping and EIA Processes as well as a separate BA process.

To ensure that you are included on the project register as an Interested and Affected Party (I&AP), as well as to raise any issues and concerns for inclusion in the Scoping/EIA Reports, you are kindly requested to register your interest in the projects and submit any comments you may have to the CSIR (at the details indicated below): **Ms. Ms Kelly Stroebel, CSIR, PO Box 320, Stellenbosch 7599, Phone: (021) 888 2432, Fax: (021) 888 2693 or Email: kstrobel@csir.co.za**. You have until on or before **23 October 2017** to do so (30 days from the date of this publication - including weekends, but excluding public holidays).

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX E:

Copies and Proof of Correspondence sent to I&APs

CONTENTS

Copies and Proof of Correspondence Sent to I&APs for the Project Initiation as well as Release of Draft Scoping Report for Review

CSIR Environmental Management Services
P. O. Box 320, Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2472
Email: kstroebel@csir.co.za

our future through science

20 September 2017

Dear Interested and Affected Party

RE: RELEASE OF DRAFT SCOPING REPORTS FOR THE PROPOSED DEVELOPMENT OF THREE SOLAR PHOTOVOLTAIC (PV) FACILITIES (REFERRED TO AS SKEERHOK PV 1, SKEERHOK PV 2 AND SKEERHOK PV 3) ON PORTION 9 OF GEMSBOK BULT 120 AND PORTION 0 OF SMUTSHOEK 395, NORTH-EAST OF KENHARDT, NORTHERN CAPE PROVINCE

juwi Renewable Energies (PTY) Ltd (i.e. "juwi") is proposing to develop three 100 Megawatt (MW) Solar Photovoltaic (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, and 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.

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2017 NEMA Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R327, R326, R325 and R324 on 7 April 2017, a full Scoping and EIA Process is required for the construction of the three Solar PV facilities. A separate Basic Assessment Process will be undertaken for the development of the proposed transmission lines, associated electrical infrastructure and connection to the Eskom Nieuwehoop Substation. The Council for Scientific and Industrial Research (CSIR) has been appointed by the Project Applicant to undertake the separate required Basic Assessment and Scoping and EIA Processes for the proposed projects.

The proposed 100 MW Solar PV facility projects (requiring a Scoping and EIA Process) and the Basic Assessment project are referred to as:

Scoping and EIA Processes: Proposed 75 MW Solar PV Facilities	Basic Assessment Processes: Proposed 132 kV Transmission Lines and Associated Electrical Infrastructure
▪ Skeerhok PV 1 ▪ Skeerhok PV 2 ▪ Skeerhok PV 3	▪ Skeerhok PV – Transmission Line

Table 1 below indicates the Project Applicant details, as well as brief project details.

Table 1: Details of the Scoping and EIA Projects

Project Reference	Project Applicant	Generation Capacity	Project Footprint	Available Development Area
Skeerhok PV 1	juwi Renewable Energies (PTY) Ltd	100 MW	300 ha	400 ha
Skeerhok PV 2		100 MW	300 ha	570 ha
Skeerhok PV 3		100 MW	300 ha	350 ha

juwi is an integrated independent power producer that is focused on making solar energy a sustainable and affordable source on a global scale. Linked to enhancing its operations within South Africa, each 100 MW Solar PV facility will cover an approximate area of 300 ha (as noted in Table 1 above). The area available to develop at the preferred sites exceeds the required project footprint area, and therefore there is scope to avoid major environmental constraints through the final design and layout of the facility. The proposed projects will entail the construction of a solar field, buildings, electrical infrastructure, internal access roads, and associated infrastructure and structures.

Since the proposed 100 MW Solar PV facilities are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process (PPP) will be undertaken for the proposed projects. However, separate Applications for Environmental Authorisation (EA) have been lodged with the Competent Authority (i.e. the National Department of Environmental Affairs (DEA)) for each proposed Scoping and EIA project and will be lodged for the Basic Assessment project. Furthermore, separate reports (i.e. Basic Assessment and Scoping and EIA Reports) will be compiled for each project. The Basic Assessment Report will be made available for Interested and Affected Party (I&AP) and stakeholder review together with the EIA Reports.

In line with the above, as a registered I&AP on the project database, you are hereby notified of the release of the Scoping Reports for the Skeerhok PV 1, Skeerhok PV 2 and Skeerhok PV 3 projects to all registered I&APs and stakeholders for a 30-day review period, which will extend from **20 September 2017 to 23 October 2017.**

Hard copies of the Scoping Reports are available for public viewing at the Kenhardt Library (in Park Street). The Draft Scoping Reports can also be downloaded from the following website: https://www.csir.co.za/environmental-impact-assessment

All comments received during this 30 day review period will be recorded and included in the Final Scoping Reports for submission to the National DEA for decision-making in line with Regulations 21 and 22 of the 2014 EIA Regulations (GN R326). As a registered I&AP on the project database, you will be notified of the submission of the Final Scoping Reports to the DEA for decision-making.

Should you have any queries or require additional information please do not hesitate to contact the undersigned using the contact details provided above.

Sincerely,

Surina Laurie
Project Leader
CSIR Environmental Management Services

Kelly Stroebel
Project Manager
CSIR Environmental Management Services

Email sent to all I&APs on 20 September 2017

From: Kelly Stroebel
To:
BC MRabothata@environment.gov.za; HAlberts@environment.gov.za; wlutsch@environment.gov.za; oriba@ncpg.gov.za; mmathews@ncpg.gov.za; sdelafontaine@gmail.com; elsabe.dtec@gmail.com; sb@siyanda.gov.za; fpr@bodr.gov.za; teresascheepers@vodamail.co.za; gloria.tlaky@gmail.com; mm@kaigarib.gov.za; clarkem@kaigarib.gov.za; MeiM@dwa.gov.za; CloeteS@dws.gov.za; SchwartzC@dws.gov.za; mndzilili@ncpg.gov.za; smbanjwa@ncpg.gov.za; ltoolsbernado@ncpg.gov.za; MashuduMa@daff.gov.za; ThokoB@daff.gov.za; nhlakad@daff.gov.za; annelizac@nda.agric.za; JacolineMa@daff.gov.za; aditeme@agri.ncape.gov.za; peter.buys@nersa.org.za; klawrence@trpw.ncape.gov.za; waltjc@nra.co.za; AbrahamsN@nra.co.za; monica.lepheane@labour.gov.za; rwarie@ncpg.gov.za; ratha.timothy@gmail.com; strohl@caa.co.za; GeerinJH@eskom.co.za; LeaskK@eskom.co.za; WyngaaJO@eskom.co.za; HaarhL@eskom.co.za; sharon@nocci.co.za; atiplady@ska.ac.za; Marina.Lourens@transnet.net; Gilbert.Nortier@transnet.net; Mayvyn.Bhana@transnet.net; Clive.Stephenson@transnet.net; rredelstorff@sahra.org.za; Kgauta.Mokoena@dmr.gov.za; esibeko@dtps.gov.za; chris@salt.ac.za; raoul@salt.ac.za; advocacy@birdlife.org.za; l.ntsolo@sanbi.org.za; admin@grasslands.org.za; wep@ewt.org.za; joh.henschel@saeon.ac.za; pruplal@icasa.org.za; pietk@karsten.co.za; straussdj@stocksandstrauss.com; vanwyk88@hotmail.com; mitchell.hodgson@scatecsolar.com; claude@veroniva.co.za; karen@mulilo.com; Babalwa Mqokeli; Cleo Forster; Surina Laurie; howard.hendricks@sanparks.org; ncagric@worldonline.co.za; ontvang@agric.co.za; ptiger@ncpg.gov.za
Date: 18/09/2017 11:23
Subject: juwi Skeerhok PV projects; release of DSR's for public comment
Attachments: CSIR Letter to I&APs_juwi Skeerhok PV projects.pdf

Dear Stakeholder,

RE: release of Draft scoping reports for the Proposed development of three Solar Photovoltaic (PV) Facilities (referred to as Skeerhok pv 1, Skeerhok pv 2 and Skeerhok pv 3) on Portion 9 oF GEMSBOK BULT 120 AND PORTION 0 OF SMUTSHOEK 395, north-east of Kenhardt, Northern Cape Province

Please see attached letter notifying you of the availability of the three above-mentioned Draft Scoping Reports for public comment. In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2017 NEMA Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R327, R326, R325 and R324 on 7 April 2017, a full Scoping and EIA Process is required for the construction of the three Solar PV facilities. (CSIR) has been appointed by the Project Applicant (juwi Renewable Energies (Pty) Ltd) to undertake the separate required Basic Assessment and Scoping and EIA Processes for the proposed projects.
Hard copies of the Scoping Reports are available for public viewing at the Kenhardt Library (in Park Street). The Draft Scoping Reports can also be downloaded from the following website: https://www.csir.co.za/environmental-impact-assessment

The comment period extends from Wednesday 20th September 2017 to Monday 23rdOctober 2017. Please submit any comments on the DSR's to the CSIR project manager (contact details below) by the 23rd October 2017.
Kindly contact the undersigned for further information or for any queries relating to the above.
Kind Regards,

Kelly Stroebel
Environmental Assessment Practitioner (EAP)
CSIR Stellenbosch

kstroebel@csir.co.za
Tel. : 021 888 2432
PO Box 320, Stellenbosch, 7599

Proof of Delivery of Email sent to all I&APs on 20 September 2017

Message Id:	59BF90AA.8AD : 70 : 17837
Subject:	juwi Skeerhok PV projects; release of DSR's for public comment
Created By:	KStroebel@csir.co.za
Scheduled Date:	
Creation Date:	18/09/2017 11:23
From:	Kelly Stroebel

Recipients:

Recipient	Action	Date & Time
agri.ncape.gov.za	Transferred	20/09/2017 09:00
BC: aditeme@agri.ncape.gov.za(aditeme@agri.ncape.gov.za)		
agric.co.za	Transfer Failed	20/09/2017 09:00
BC: ontvang@agric.co.za(ontvang@agric.co.za)	Undeliverable	20/09/2017 09:00
birdlife.org.za	Transferred	20/09/2017 09:01
BC: advocacy@birdlife.org.za(advocacy@birdlife.org.za)		
bodr.gov.za	Transfer Failed	20/09/2017 09:00
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BC: ratha.timothy@gmail.com(ratha.timothy@gmail.com)		
BC: sdelafontaine@gmail.com(sdelafontaine@gmail.com)		
grasslands.org.za		20/09/2017 09:00

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BC: AbrahamsN@nra.co.za(AbrahamsN@nra.co.za)		

BC: Babalwa Mqokeli(BMqokeli@csir.co.za)	Read	20/09/2017 10:35
BC: Surina Laurie(SLaurie@csir.co.za)	Third-Party Downloaded Read	20/09/2017 09:00 20/09/2017 09:00
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BC: mitchell.hodgson@scatecsolar.com(mitchell.hodgson@scatecsolar.com)		
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BC: Gilbert.Nortier@transnet.net(Gilbert.Nortier@transnet.net)		
BC: Marina.Lourens@transnet.net(Marina.Lourens@transnet.net)		
BC: Mayvyn.Bhana@transnet.net(Mayvyn.Bhana@transnet.net)		
trpw.ncape.gov.za	Transfer Failed	20/09/2017 09:00
BC: klawrence@trpw.ncape.gov.za(klawrence@trpw.ncape.gov.za)	Undeliverable	20/09/2017 09:00

Proof of Delivery of hard copies of each report (Courier Waybills and Receipt of Hard Copy)

Globeflight
0861 388 883
www.globeflight.com
Reg. No. 1998/009052/07 / VAT NO: 4650175351

2718308488

DATE	ACCOUNT NUMBER	COST CENTRE	SHIPPER'S REFERENCE	ORIGIN	DESTINATION	No. OF PIECES
18-9-17	P01521		EMS0140 /RLW 02100/021 SE			1

SHIPPER: (YOUR NAME) Kelly Stroebel
COMPANY NAME: CSIR - STELLENBOSCH
STREET ADDRESS: 11 JAN CILLIERS STR
STELLENBOSCH
CITY: CAPE TOWN
COUNTRY: RSA
POST/ZIP CODE: 7599
TELEPHONE NUMBER & E-MAIL: 021 888 2400

TO: (RECIPIENT'S NAME) Muhammad Essop
COMPANY NAME: Nat Dept of Environmental Affairs
STREET ADDRESS: Integrated Env Authorisations; Environment House; 473 Steve Biko Rd
CITY: Arcadia, Pretoria
COUNTRY: S.A.
POST/ZIP CODE: 0001
TELEPHONE NUMBER & E-MAIL: 012-399 9406

ACTUAL WEIGHT

PIECES	DIMENSIONS
1	X X
	X X
	X X
	X X
	X X
	X X
	X X

IMPORT & EXPORT CODE

INTERNATIONAL SERVICES: GLOBAL DOCUMENT EXPRESS; GLOBAL PARCEL EXPRESS; SPECIALS; AIRFREIGHT; CROSS BORDER ROAD FREIGHT
DOMESTIC SERVICES: OVERNIGHT EXPRESS; IN CITY DELIVERY; BUDGET CARGO 21-48 HRS; ROAD FREIGHT 48-96 HRS
DOMESTIC SERVICES: SAME DAY; DAWN DELIVERY BY 09H00; SATURDAY DELIVERY; AFTER HOURS; PUBLIC HOLIDAY

SPECIAL INSTRUCTIONS

CUSTOMS VALUE
HAZARDOUS CARGO? YES NO
INSURANCE YES NO
AMOUNT:

WE HAVE SEEN AND AGREE TO THE STANDARD CONDITIONS OF CARRIAGE OF GLOBEFLIGHT WORLDWIDE EXPRESS
PRINT NAME: A TAYLOR
SIGNATURE: ATaylor
DATE: 18-9-17 TIME:

RECEIVED BY GLOBEFLIGHT WORLDWIDE EXPRESS
PRINT NAME:
SIGNATURE:
DATE: 18/9/17 TIME:

RECEIVED IN GOOD ORDER AND CONDITION
PRINT NAME:
CONSIGNEE SIGNATURE:
DATE: TIME:

DESCRIPTION OF CONTENTS: Documents

Globeflight reserves the right to choose the service "Budget" should no service label be selected
Please note indemnity clause in Terms & Conditions

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2718308489

DATE	ACCOUNT NUMBER	COST CENTRE	SHIPPER'S REFERENCE	ORIGIN	DESTINATION	No. OF PIECES
-17	P01521		EMS0140 /RLW 02100/021 SE			1

SHIPPER: (YOUR NAME) Kelly Stroebel
COMPANY NAME: CSIR - STELLENBOSCH
STREET ADDRESS: 11 JAN CILLIERS STR
STELLENBOSCH
CITY: CAPE TOWN
POST/ZIP CODE: 7599
TELEPHONE NUMBER & E-MAIL: 021 888 2400

TO: (RECIPIENT'S NAME) Ordain Riba
COMPANY NAME: Provincial Dept of Environment + Nature Conserv
STREET ADDRESS: N/Cape; Sasko Building, 90 Long Street
CITY: Kimberley
COUNTRY: S.A.
POST/ZIP CODE: 8301
TELEPHONE NUMBER & E-MAIL: 053 - 831 3530

ACTUAL WEIGHT

PIECES	DIMENSIONS
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	X X
	X X
	X X
	X X
	X X
	X X

IMPORT & EXPORT CODE

DOCUMENT EXPRESS; PARCEL EXPRESS; SPECIALS; FREIGHT; BORDER ROAD FREIGHT
DOMESTIC SERVICES: OVERNIGHT EXPRESS ✓; IN CITY DELIVERY; BUDGET CARGO 21-48 HRS; ROAD FREIGHT 48-96 HRS
DOMESTIC SERVICES: SAME DAY; DAWN DELIVERY BY 09H00; SATURDAY DELIVERY; AFTER HOURS; PUBLIC HOLIDAY

SPECIAL INSTRUCTIONS

CUSTOMS VALUE
YES NO
YES NO

WE HAVE SEEN AND AGREE TO THE STANDARD CONDITIONS OF CARRIAGE OF GLOBEFLIGHT WORLDWIDE EXPRESS
PRINT NAME: A TAYLOR
SIGNATURE: ATaylor
DATE: 18-9-17 TIME:

RECEIVED BY GLOBEFLIGHT WORLDWIDE EXPRESS
PRINT NAME:
SIGNATURE:
DATE: 18/9/17 TIME:

RECEIVED IN GOOD ORDER AND CONDITION
PRINT NAME:
CONSIGNEE SIGNATURE:
DATE: TIME:

DESCRIPTION OF CONTENTS: Documents

reserves the right to choose the service "Budget" should no service label be selected
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beflight

0861 386 883
www.globeflight.com
Reg. No. 1996/009052/07 / VAT NO: 4650175351

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ATE	ACCOUNT NUMBER	COST CENTRE	SHIPPER'S REFERENCE	ORIGIN	DESTINATION	No. OF PIECES
)-17	P01521		EM50140 / Ren 02100 / 021 SC			1

YOUR NAME) Kelly Stroebel
NAME: STELLENBOSCH
DRESS: CILLIERS STR
NBOSCH
OWN
POST/ZIP CODE: 7599
E NUMBER & E-MAIL: 888 2400

TO: (RECIPIENT'S NAME) Melinda Mei
COMPANY NAME: Dept of Water + Sanitation
STREET ADDRESS: Louisvale Road
DO NOT DELIVER TO A P.O. BOX NO.
CITY Upington
COUNTRY: S.A.
POST/ZIP CODE: 8801
TELEPHONE NUMBER & E-MAIL: 054 - 338 5836

ACTUAL WEIGHT

PIECES	DIMENSIONS
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	X X
	X X
	X X
	X X
	X X
	X X

IMPORT & EXPORT CODE

AL DOCUMENT EXPRESS
AL PARCEL EXPRESS
IALS
REIGHT
S BORDER ROAD FREIGHT

DOMESTIC SERVICES
OVERNIGHT EXPRESS x
IN CITY DELIVERY
BUDGET CARGO 21-48 HRS
ROAD FREIGHT 48-96 HRS

DOMESTIC SERVICES
SAME DAY
DAWN DELIVERY BY 09H00
SATURDAY DELIVERY
AFTER HOURS
PUBLIC HOLIDAY

SPECIAL INSTRUCTIONS

USTOMS VALUE
S YES NO
E YES NO

WE HAVE SEEN AND AGREE TO THE STANDARD CONDITIONS OF CARRIAGE OF GLOBEFLIGHT WORLDWIDE EXPRESS
PRINT NAME: A TAYLOR
SIGNATURE: Taylor
DATE: 18-9-17 TIME:

RECEIVED BY GLOBEFLIGHT WORLDWIDE EXPRESS
PRINT NAME:
SIGNATURE:
DATE: 15/9/17 TIME:

RECEIVED IN GOOD ORDER AND CONDITION
PRINT NAME:
CONSIGNEE SIGNATURE:
DATE: TIME:

DESCRIPTION OF CONTENTS
Documents

serves the right to choose the service "Budget" should no service label be selected

Please note indemnity clause in Terms & Conditions

Follow-up Reminder Email sent to I&APs and Stakeholders on 17 October 2017 during the 30-day review of the Scoping Report

From: Kelly Stroebel
To:
BC AbrahamsN@nra.co.za; aditeme@agri.ncape.gov.za; admin@grasslands.org.za; advocacy@birdlife.org.za; annelizac@nda.agric.za; atiplady@ska.ac.za; chris@salt.ac.za; clarkem@kaigarib.gov.za; claude@veroniva.co.za; Clive.Stephenson@transnet.net; CloeteS@dws.gov.za; elsabe.dtec@gmail.com; esibeko@dtps.gov.za; fpr@bodr.gov.za; GeerinJH@eskom.co.za; Gilbert.Nortier@transnet.net; gloria.tlaky@gmail.com; HaarhL@eskom.co.za; HAlberts@environment.gov.za; howard.hendricks@sanparks.org; JacolineMa@daff.gov.za; joh.henschel@saeon.ac.za; karen@mulilo.com; Kgauta.Mokoena@dmr.gov.za; klawrence@trpw.ncape.gov.za; l.ntsolo@sanbi.org.za; LeaskK@eskom.co.za; ltoolsbernado@ncpg.gov.za; Marina.Lourens@transnet.net; MashuduMa@daff.gov.za; Mayvyn.Bhana@transnet.net; MeiM@dwa.gov.za; mitchell.hodgson@scatecsolar.com; mm@kaigarib.gov.za; mmathews@ncpg.gov.za; mndzilili@ncpg.gov.za; monica.lepheane@labour.gov.za; MRabothata@environment.gov.za; ncagric@worldonline.co.za; nhlakad@daff.gov.za; ontvang@agric.co.za; oriba@ncpg.gov.za; peter.buys@nersa.org.za; pietk@karsten.co.za; pruplal@icasa.org.za; ptiger@ncpg.gov.za; raoul@salt.ac.za; ratha.timothy@gmail.com; rredelstorff@sahra.org.za; rwarie@ncpg.gov.za; sb@siyanda.gov.za; SchwartzC@dws.gov.za; sdelafontaine@gmail.com; sharon@nocci.co.za; smbanjwa@ncpg.gov.za; straussdj@stocksandstrauss.com; strohl@caa.co.za; teresascheepers@vodamail.co.za; ThokoB@daff.gov.za; vanwyk88@hotmail.com; waltjc@nra.co.za; wep@ewt.org.za; wlutsch@environment.gov.za; WyngaaJO@eskom.co.za

Date: 17/10/2017 12:36
Subject: REMINDER: juwi Skeerhok PV projects: release of DSR's for public comment
Attachments: CSIR Letter to I&APs_juwi Skeerhok PV projects.pdf

Dear Stakeholder,

Please be reminded that the comment period for the below-mentioned juwi Skeerhok Solar PV 1, 2 and 3 Draft Scoping Reports ends next week **Monday the 23rd October.** Kindly submit all comments to the undersigned by that date.

Please contact me should you require any further information.

Kind Regards,

Kelly Stroebel
Environmental Assessment Practitioner (EAP)
CSIR Stellenbosch

kstroebel@csir.co.za
Tel. : 021 888 2432
PO Box 320, Stellenbosch, 7599

>>> Kelly Stroebel 18/09/2017 11:23 >>>
Dear Stakeholder,

RE: release of Draft scoping reports for the Proposed development of three Solar Photovoltaic (PV) Facilities (referred to as Skeerhok pv 1, Skeerhok pv 2 and Skeerhok pv 3) on PoRTion 9 oF GEMSBOK BULT 120 AND PORTION 0 OF SMUTSHOEK 395, north-east of Kenhardt, Northern Cape Province

Please see attached letter notifying you of the availability of the three above-mentioned Draft Scoping Reports for public comment. In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2017 NEMA Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R327, R326, R325 and R324 on 7 April 2017, a full Scoping and EIA Process is required for the construction of the three Solar PV facilities. (CSIR) has been appointed by the Project Applicant (juwi Renewable Energies (Pty) Ltd) to undertake the separate required Basic Assessment and Scoping and EIA Processes for the proposed projects.

Hard copies of the Scoping Reports are available for public viewing at the Kenhardt Library (in Park Street). The Draft Scoping Reports can also be downloaded from the following website: https://www.csir.co.za/environmental-impact-assessment

The comment period extends from Wednesday 20th September 2017 to Monday 23rdOctober 2017. Please submit any comments on the DSR’s to the CSIR project manager (contact details below) by the 23rd October 2017.

Kindly contact the undersigned for further information or for any queries relating to the above.

Kind Regards,

Kelly Stroebel
Environmental Assessment Practitioner (EAP)
CSIR Stellenbosch

kstroebel@csir.co.za
Tel. : 021 888 2432
PO Box 320, Stellenbosch, 7599

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX F:

Copy of Site Notice Boards and Proof of Placement

CONTENTS

Site Notice Board – English

JOINT NOTICE OF BASIC ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS

PROPOSED DEVELOPMENT OF THREE SOLAR PHOTOVOLTAIC FACILITIES AND ASSOCIATED ELECTRICAL INFRASTRUCTURE, NORTH-EAST OF KENHARDT, NORTHERN CAPE PROVINCE

Notice is given in terms of Environmental Impact Assessment (EIA) Regulations under, sub-regulation 41 (2) (a), published in Government Gazette 40772 of 7 April 2017, of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA), that juwi Renewable Energies (Pty) Ltd (herein after referred to as "juwi") proposes to construct and operate 3 x 100 Megawatt (MW) Solar Photovoltaic (PV) Facilities and associated electrical infrastructure (subject to a separate Basic Assessment Process) near Kenhardt in the Northern Cape Province. The proposed Facilities will be constructed on two land portions, namely Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult Farm 120, located approximately 43 km north-east of Kenhardt. The proposed Solar Facilities will be connected to the Nieuwehoop Substation via 132 kV transmission lines for each 100 MW Facility.

A full Scoping and EIA Process is required for the construction of the three Solar PV Facilities. A separate Basic Assessment Process is also required and will be undertaken for the development of the proposed transmission lines. The CSIR has been appointed by juwi to undertake the required Basic Assessment and Scoping and EIA Processes for the proposed projects. The need for a Basic Assessment and Scoping and EIA is triggered by the following potential listed activities listed in GNR 324,325 and 327:

Government Notice	Listed Activity Number
GNR 327, 7 April 2017	Activity 11; Activity12 (x) and (xii); Activity 19 (i); Activity 24 (ii) and Activity 28 (ii)
GNR 325, 7 April 2017	Activity 1; Activity 14 and Activity 15
GNR 324, 7 April 2017	Activity 18

Since the proposed 100 MW Solar PV Facilities are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process will be undertaken for the proposed projects. However, separate Applications for Environmental Authorisation (EA) will be lodged with the Competent Authority (i.e. the National Department of Environmental Affairs (DEA)) for each proposed Solar PV Facility and transmission line. Separate reports (i.e. Basic Assessment and Scoping and EIA Reports) will be compiled for each project.

To ensure that you are included on the project register as an Interested and Affected Party (I&AP), as well as to raise any issues and concerns for inclusion in the Scoping/EIA Reports, you are kindly requested to register your interest in the projects and submit any comments you may have to the CSIR (at the details indicated below).

Ms Kelly Stroebel
PO Box 320, Stellenbosch, 7599
Tel: 021 888 2432
Fax: 021 888 2693
Email: kstrobel@csir.co.za

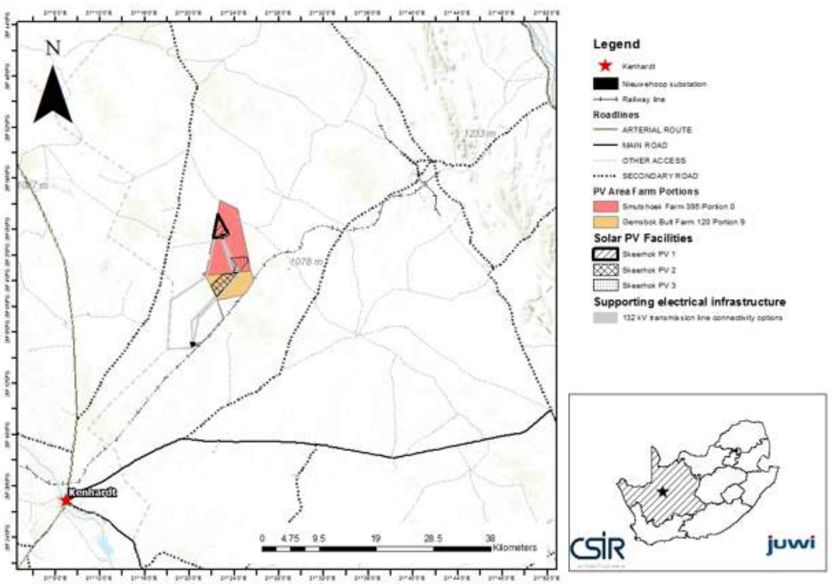


Figure: Locality Map depicting the location of the proposed three Solar Photovoltaic Facilities

Site Notice Board - Afrikaans

GEKOMBINEERDE KENNISGEWING VAN OMGEWINGSIMPAKSTUDIE (OIS) EN BASIESE BESTEKOPNAME PROSESSE

GEINTEGREERDE PUBLIEKE DEELNAME PROSES VIR DIE VOORGESTELDE DRIE FOTOVOLTAÏSE SONKRAGAANLEGTE VAN 100 MW ELK EN MEEGAANDE ELEKTRIESE INFRASTRUKTUUR VIR JUWI NABY KENHARDT IN DIE NOORD-KAAP PROVINSIE

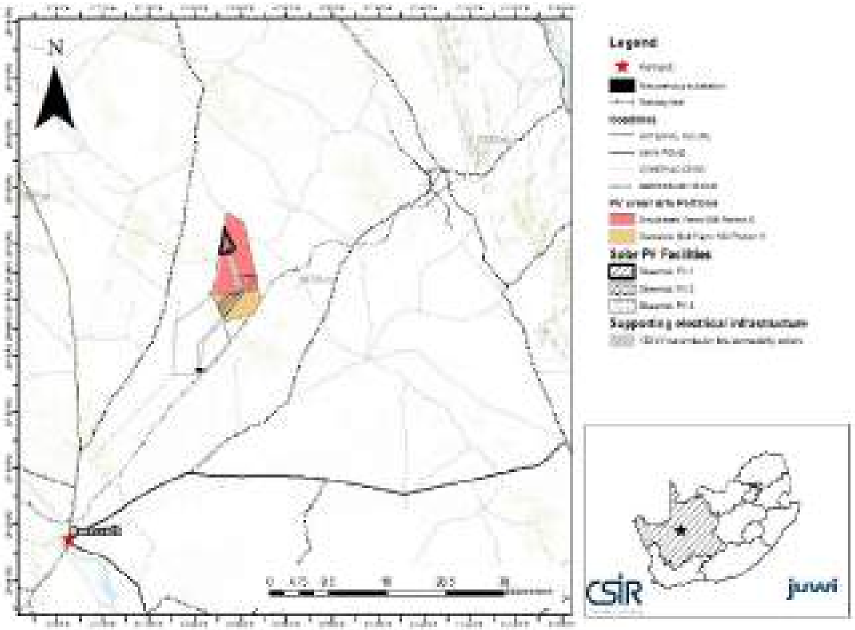
Hiermee word kennis gegee in terme van Regulasie 41 (2) van die Omgewingsimpakstudie (OIS) Regulasies soos gepubliseer in Staatskoerant No 40772 op 7 April 2017, van die Nasionale Omgewingsbeheer Wet, 1998 (Wet No 107 van 1998) (NEMA), dat juwi Renewable Energies' (Pty) Ltd (hierna verwys as "juwi") van voorneme is om drie fotovoltaïse sonkragaanlegte van 100 MW elk en drie geassosieerde kraglyne te installer en te bedryf naby Kenhardt in die Noord Kaap. Die kraglyne sal deel uitmaak en geassesseer word in drie aparte Basiese Evalueringsprosesse wat later onderneem sal word. Die voorgestelde fotovoltaïse sonkragaanlegte sal aansluit by die Nieuwehoop Substasie via drie 132 kV kraglyne (een vir elke fotovoltaïse sonkragaanleg. Die voorgestelde fotovoltaïse sonkragaanlegte sal opgerig word op die volgende plase: Gedeeltes 0 van Smutshoek Plaas 395 en Gedeelte 9 van Gemsbok Bult Plaas 120, geleë ongeveer 43 km noord oos van Kenhardt.

Die beoogde drie fotovoltaïse sonkragaanlegte vereis dat 'n Omvangsbepaling en Omgewingsevaluering (OIE) proses onderneem moet word. Die drie kraglyne vereis dat 'n Basiese Evalueringsproses onderneem word. Die Wetenskaplike en Nywerheidsnavorsingsraad (WNNR) is deur juwi aangestel om die vereiste prosesse te onderneem. Die prosesse word benodig omdat die volgende aktiwiteite soos gelys in Staatskennisgewings R 324, R 325 en R 327 van toepassing is:

Staatskennisgewing	Gelyste aktiwiteite
GNR 327, 7 April 2017	Aktiwiteite 11; 12 (x) en (xii); 19 (i); 24 (ii) en 28 (ii)
GNR 325, 7 April 2017	Aktiwiteite 1; 14 & 15
GNR 324, 7 April 2017	Aktiwiteit 18

Aangesien al drie son plaas projekte in dieselfde geografiese area geleë is en dieselfde tipe aktiwiteit behels sal 'n geïntegreerde Publieke Deelname Proses onderneem word. Drie aparte aansoeke en OIE verslae sal ingedien word vir evaluering deur die Nasionale Departement van Omgewingsake vir die fotovoltaïse sonkragaanlegte. Drie aparte aansoeke sal ook ingedien word vir die geassosieerde kraglyne en dit sal onderhewig wees aan drie aparte Basiese Bestekopname prosesse waarvoor drie aparte verslae opgestel gaan word.

Om te verseker dat u vir die projekte as 'n Belangstellende en Geaffekteerde Party (B&GP) geregistreer word of om enige kwessie uit te lig aangaande die projekte, word u vriendelik versoek om te registreer vir die projek en u kommentaar aan WNNR se projek bestuurder (inligting hieronder) te stuur.



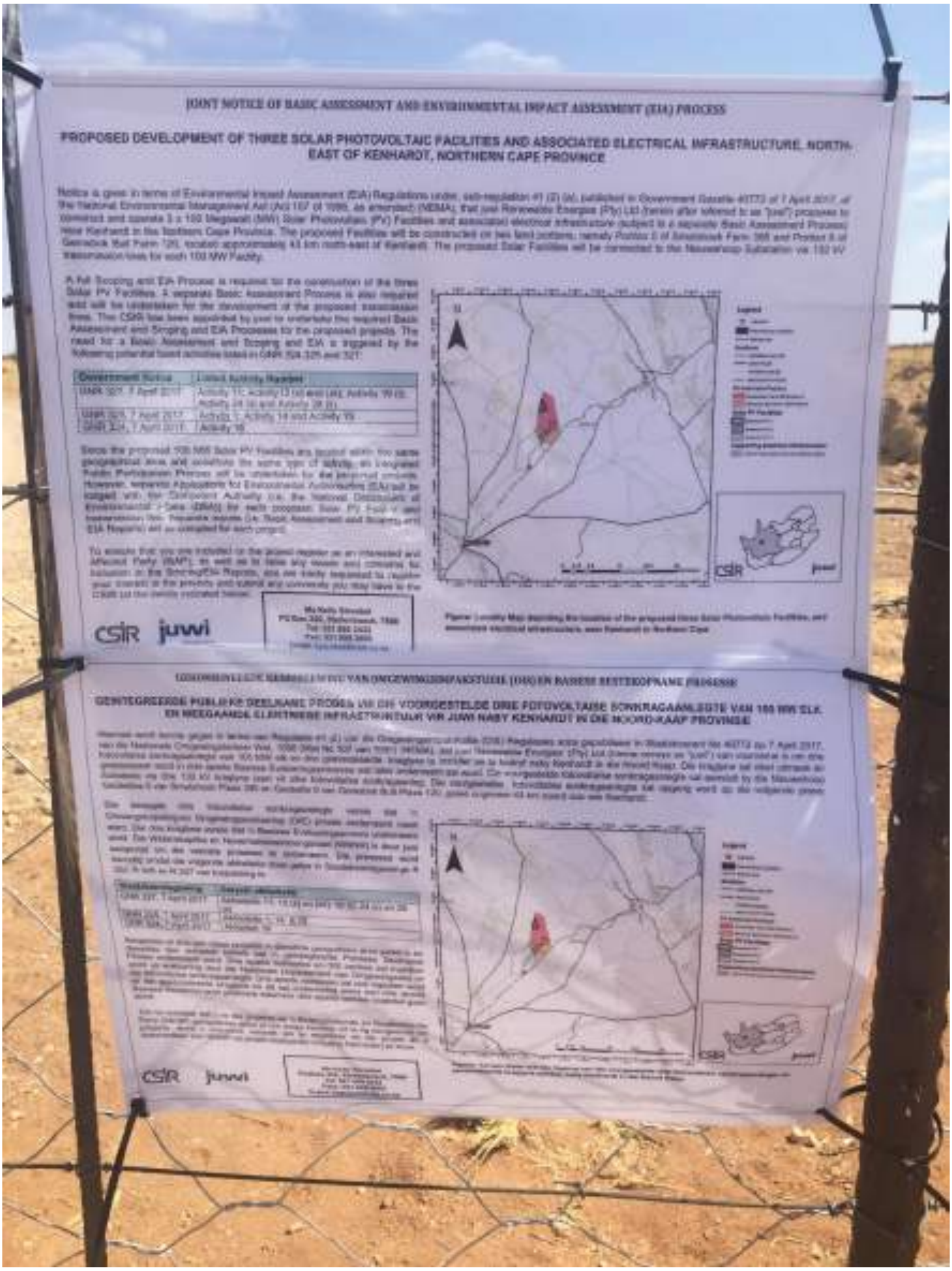
Figuur: Terrein Kaart wat die ligging van die voorgestelde drie fotovoltaïse sonkragaanlegte en geassosieerde kraglyne aandui, naby Kenhardt in die Noord Kaap.

Ms Kelly Stroebel
Posbus 320, Stellenbosch, 7599
Tel: 021 888 2432
Faks: 021 888 2693
E-pos: kstrobel@csir.co.za

CSIR juwi

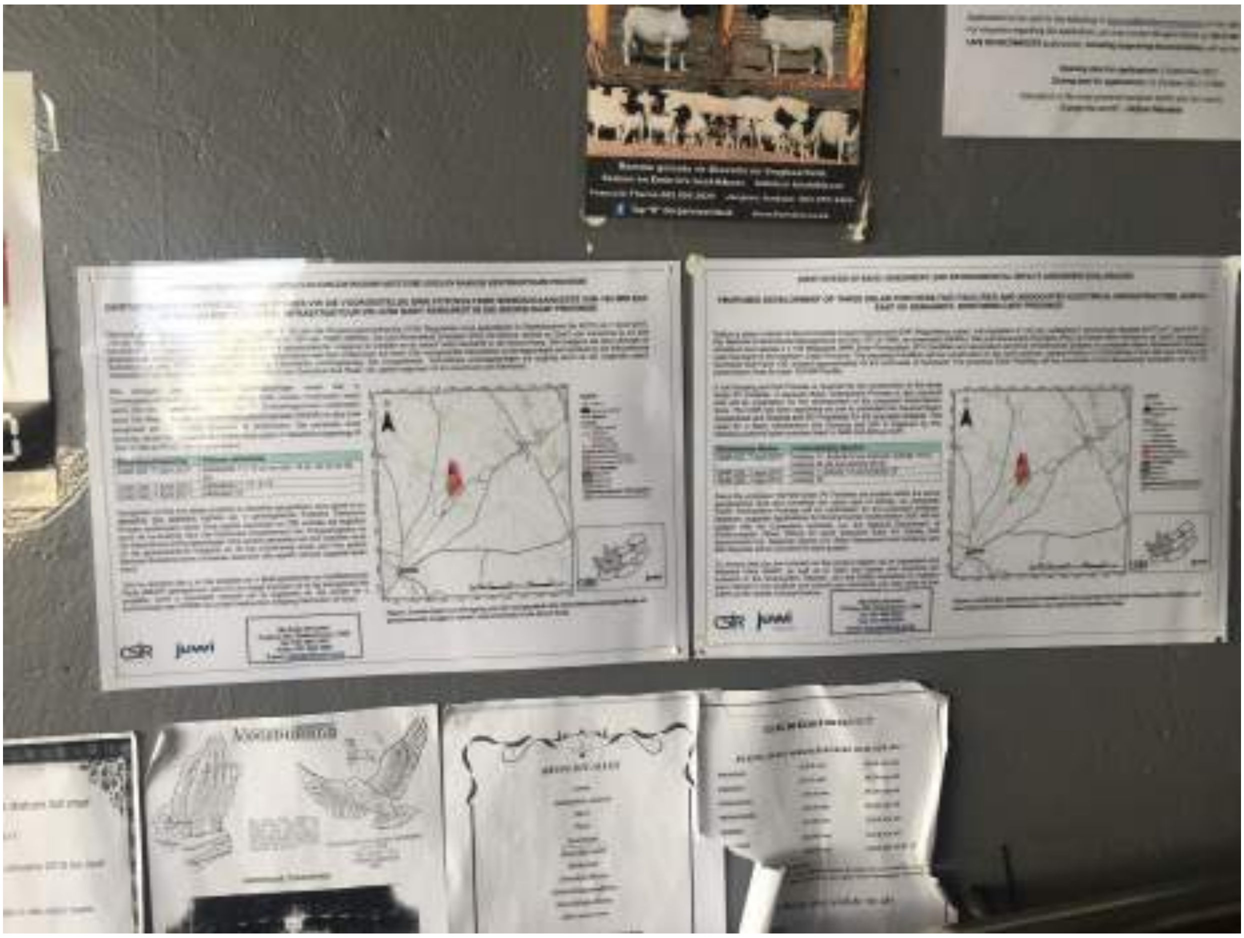
Proof of Placement of Site Notice Boards: 19th September 2017

Site Notice Board (English and Afrikaans) placed at the entrance to the site, which serves as one of the access routes. GPS Co-ordinates of the site notice: 29º4'3"S; 21º25'35"E

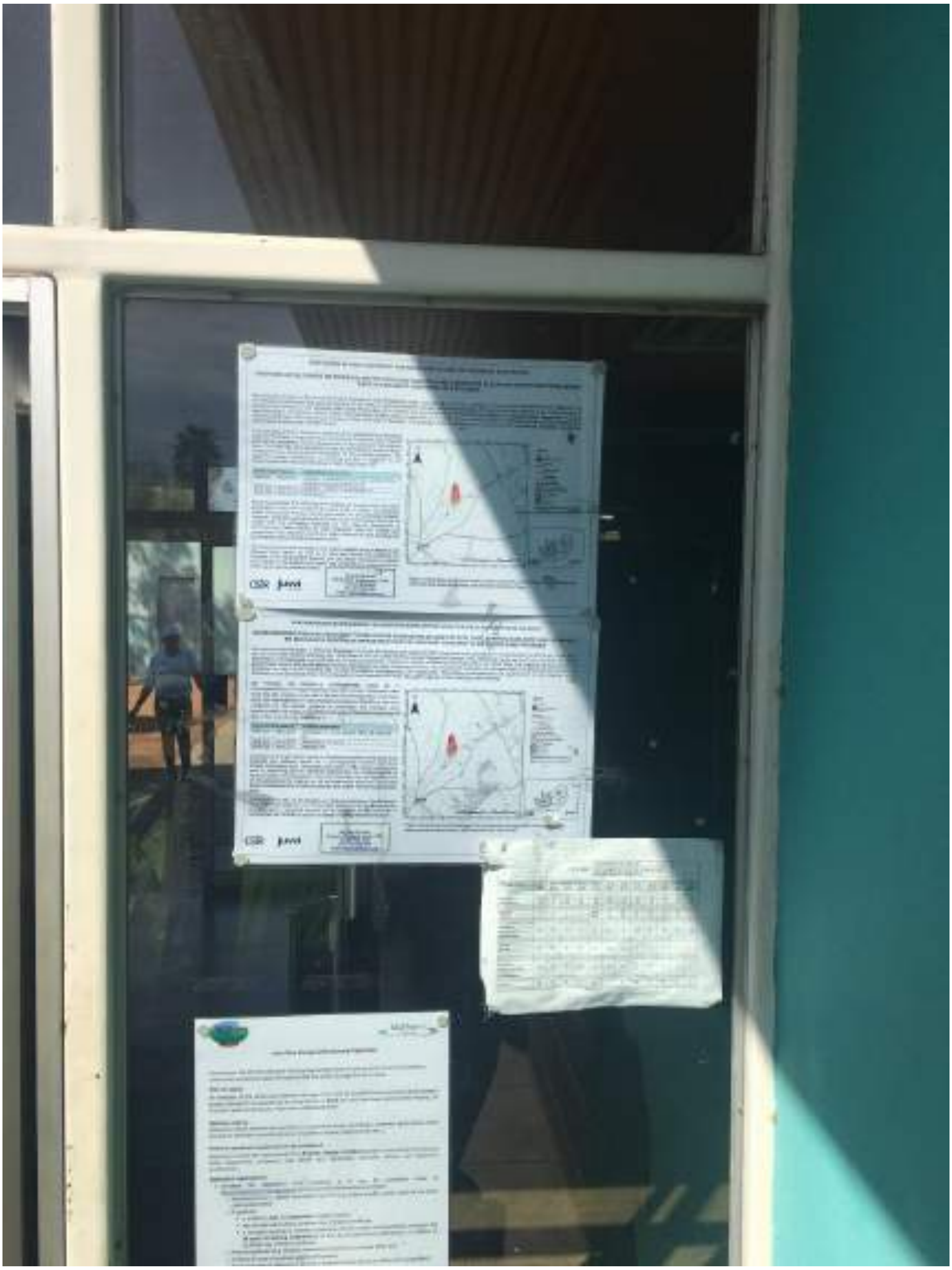


Site Notice Board (English and Afrikaans) placed at the entrance to the site, which serves as one of the access routes. GPS Co-ordinates of the site notice: 29º4'3"S; 21º25'35"E

Additional Locations of the site notices placed on 19th September 2017



Site Notice Board (English and Afrikaans) placed at the Kenhardt Petrol Station.



Close up image of the Site Notice Board (English and Afrikaans) placed at the Kai !Garib Municipality Offices in Kenhardt.

Site Notice Board (English and Afrikaans) placed at the entrance to the Transnet road (alongside the railway line), which serves as one of the access routes to the project sites.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX G:

Communication from I&APs

From: Elsabe Swart <elsabe.dtec@gmail.com>
To: <kstroebel@csir.co.za>
CC: Conrad Geldenhuys <c.geldenhuys@hotmail.com>, Louise Geldenhuys <geldenhuys.louise1@gmail.com>, Marnus Smit <zmsmit.denc@gmail.com>, Natalie Uys <nuys.denc@gmail.com>, Peter Cloete <peter.denc87@gmail.com>, Peter Ramollo <ramollopp@gmail.com>, Samantha De la Fontaine <sdelafontaine@gmail.com>
Date: 20/09/2017 12:13
Subject: Fwd: juwi Skeerhok PV projects; release of DSR's for public comment
Attachments: CSIR Letter to I&APs_juwi Skeerhok PV projects.pdf

Dear Kelly

Due to short notice, there is not enough time to go through the documentation.

However, I would like to highlight some aspects that must be considered and responded to:

1. Should any impact occur within a CBA area (2017 version) within the Northern Cape, it will trigger a biodiversity offset. Accordingly, a biodiversity status assessment report must be prepared as well for consideration.
2. Confirmation must be obtained from SKA that the development planned will not negatively effect SKA activities or plans, nor will it be within their declared spatial area declared in Government Gazette.

Thank you

From: Claude Bosman <claude@veroniva.co.za>
To: Kelly Stroebel <KStroebel@csir.co.za>
CC: Surina Laurie <SLaurie@csir.co.za>
Date: 21/09/2017 10:19
Subject: Re: juwi Skeerhok PV projects; release of DSR's for public comment

[The e-mail server of the sender could not be verified (SPF Record)]

Hi Kelly,

Can you please send me the KMZ links for the 3x proposed project sites and power corridor to the sub station ?

Thanks
Claude

Claude Bosman (CA) SA
Veroniva (Pty) Ltd - Energy | Property
Tel +27 (0)82 331 4098
www.veroniva.co.za

From: Lizelle Stroh <StrohL@caa.co.za>
To: Kelly Stroebel <KStroebel@csir.co.za>
Date: 21/09/2017 13:19
Subject: RE: juwi Skeerhok PV projects; release of DSR's for public comment
Attachments: Solar Park footprint corners.xls; Pylon Geographic co ordinates.xls

Your enquiry regarding approval from the SACAA with regard to PV farms refers.
There is a SACAA process whereby permission is applied for wrt obstacles which could pose an aviation hazard. More information can be obtained at http://www.caa.co.za. Click on information for industry ‘Obstacles’ on the LHS. Forms, Part 139-27 and submit on the form itself.

· Kindly provide a .kml (Google Earth) file reflecting the footprint of the proposed development site including the proposed overhead electric power line route that will evacuate the generated power to the national grid.

· Also indicate the highest structure of the project & the Overhead electric power transmission line.

· Note that there may be other wind farms and PV farms in the area. Unique names are preferable.

· Please always use the proposed PV farm name in the Subject box when corresponding via email with this office and indicate the name & address which should appear on the CAA approval/decline letter.

· There is an assessment fee of R820 per application.
· For billing purposes: company name VAT nr. and postal details.
· Kindly ensure that all the above data is forwarded. Incomplete data causes unnecessary delays.

Kind regards

Lizell Stroh
Obstacle Inspector
PANS-OPS (Procedures for Air Navigation Services-Aircraft Operations)
Air Navigation Services
Tel: 011 545 1232 | Fax: 011 545 1451 | Email: strohl@caa.co.za<mailto:strohl@caa.co.za> | www.caa.co.za

From: "Marina Lourens Transnet Freight Rail" <Marina.Lourens@transnet.net>
To: Kelly Stroebel <KStroebel@csir.co.za>
Date: 22/09/2017 08:38
Subject: FW: juwi Skeerhok PV projects; release of DSR's for public comment
Attachments: Scoping Locality Map_PV AREA 1 (new corridor).tif

[The e-mail server of the sender could not be verified (SPF Record)]

Hi Kelly

Please see mail below from Johannes Hanekom

Thanks

From: Johannes Hanekom *Transnet Property CPT
Sent: 21 September 2017 10:48 AM
To: Marina Lourens Transnet Freight Rail <Marina.Lourens@transnet.net>
Cc: Burton Siljeur *Transnet Property CPT <Burton.Siljeur@transnet.net>
Subject: FW: juwi Skeerhok PV projects; release of DSR's for public comment

Hi Marina

It seems that the Sishen - Saldanha Iron Ore line (between Kenhardt – Rugseer) will not be directly affected by this proposal.

This office in principle has no objection to the proposed application.

With thanks.

Regards

[Jaco Hanekom]

From: John Geeringh <GeerinJH@eskom.co.za>
To: Kelly Stroebel <KStroebel@csir.co.za>
Date: 28/09/2017 13:20
Subject: RE: juwi Skeerhok PV projects; release of DSR's for public comment
Attachments: Eskom requirements for work in or near Eskom servitudes SOLAR (3).doc; Renewable Energy Generation Plant Setbacks to Eskom Infrastructure - Signed.pdf

[The e-mail server of the sender could not be verified (SPF Record)]

Please find attached Eskom requirements for works at or near Eskom infrastructure. Please send me KMZ files of the development and proposed grid connection when available.

Regards
John Geeringh (Pr Sci Nat)
Senior Consultant Environmental Management
Eskom: GC Land Development
D1 Y39
Megawatt Park
P O Box 1091
Johannesburg
2000

Tel: 011 516 7233
Fax: 086 661 4064
Cell: 083 632 7663
E-mail: john.geeringh@eskom.co.za

Eskom requirements for work in or near Eskom servitudes.

1. Eskom's rights and services must be acknowledged and respected at all times.

2. Eskom shall at all times retain unobstructed access to and egress from its servitudes.

3. Eskom's consent does not relieve the developer from obtaining the necessary statutory, land owner or municipal approvals.

4. Any cost incurred by Eskom as a result of non-compliance to any relevant environmental legislation will be charged to the developer.

5. If Eskom has to incur any expenditure in order to comply with statutory clearances or other regulations as a result of the developer's activities or because of the presence of his equipment or installation within the servitude restriction area, the developer shall pay such costs to Eskom on demand.

6. The use of explosives of any type within 500 metres of Eskom's services shall only occur with Eskom's previous written permission. If such permission is granted the developer must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard.

7. Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion. The measures taken shall be to Eskom's satisfaction.

8. Eskom shall not be liable for the death of or injury to any person or for the loss of or damage to any property whether as a result of the encroachment or of the use of the servitude area by the developer, his/her agent, contractors, employees, successors in title, and assignees.

The developer indemnifies Eskom against loss, claims or damages including claims pertaining to consequential damages by third parties and whether as a result of damage to or interruption of or interference with Eskom's services or apparatus or otherwise. Eskom will not be held responsible for damage to the developer's equipment.

9. No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the developer must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager

   Note: Where and electrical outage is required, at least fourteen work days are required to arrange it.

10. Eskom's rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with.

11. Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.

12. The clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated by *Regulation 15* of the *Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).*

13. Equipment shall be regarded electrically live and therefore dangerous at all times.

14. In spite of the restrictions stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), as an additional safety precaution, Eskom will not approve the erection of houses, or structures occupied or frequented by human beings, under the power lines or within the servitude restriction area.

15. Eskom may stipulate any additional requirements to highlight any possible exposure to Customers or Public to coming into contact or be exposed to any dangers of Eskom plant.

16. It is required of the developer to familiarise himself with all safety hazards related to Electrical plant.

17. Any third party servitudes encroaching on Eskom servitudes shall be registered against Eskom's title deed at the developer's own cost. If such a servitude is brought into being, its existence should be endorsed on the Eskom servitude deed concerned, while the third party's servitude deed must also include the rights of the affected Eskom servitude.

John Geeringh (Pr Sci Nat)
Senior Consultant Environmental Management

Eskom GC: Land Development

Eskom	SCOT	Technology

Title:	**Renewable Energy Generation Plant Setbacks to Eskom Infrastructure**	Unique Identifier:	**240-65559775**
		Alternative Reference Number:	**N/A**
		Area of Applicability:	**Power Line Engineering**
		Documentation Type:	**Guideline**
		Revision:	**0**
		Total Pages:	**8**
		Next Review Date:	**N/A**
		Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	**Approved by**	**Authorised by**
J W Chetty	**V Naidoo**	**R A Vajeth**
Mechanical Engineer	**Chief Engineer (Lines)**	**Acting Snr Manager (Lines)**
Date: 20/02/2014	Date: 24/02/2014	Date: 27/2/2014
		Supported by SCOT/SC
		R Vajeth
		SCOT/SC/ Chairperson
		Date: 27/2/2014

PCM Reference: 240-65132732 **LINE ENGINEERING SERVICES**
SCOT Study Committee Number/Name : **OVERHEAD LINES**

CONTENTS

FIGURES

EXECUTIVE SUMMARY

In recent decades, the use of wind turbines, concentrated solar plants and photovoltaic plants have been on the increase as it serves as an abundant source of energy. This document specifies setbacks for wind turbines and the reasons for these setbacks from infrastructure as well as setbacks for concentrated solar plants and photovoltaic plants. Setbacks for wind turbines employed in other countries were compared and a general setback to be used by Eskom was suggested for use with wind turbines and other renewable energy generation plants.

1. INTRODUCTION

During the last few decades, a large amount of wind turbines have been installed in wind farms to accommodate for the large demand of energy and depleting fossil fuels. Wind is one of the most abundant sources of renewable energy. Wind turbines harness the energy of this renewable resource for integration in electricity networks. The extraction of wind energy is its primary function and thus the aerodynamics of the wind turbine is important. There are many different types of wind turbines which will all exhibit different wind flow characteristics. The most common wind turbine used commercially is the Horizontal Axis Wind Turbine. Wind flow characteristics of this turbine are important to analyse as it may have an effect on surrounding infrastructure.

Wind turbines also cause large turbulence downwind that may affect existing infrastructure. Debris or parts of the turbine blade, in the case of a failure, may be tossed behind the turbine and may lead to damage of infrastructure in the wake path.

This document outlines the minimum distances that need to be introduced between a wind turbine and Eskom infrastructure to ensure that debris and / or turbulence would not negatively impact on the infrastructure.

Safety distances of wind turbines from other structures as implemented by other countries were also considered and the reasons for their selection were noted.

Concentrated solar plants and photovoltaic plants setbacks away from substations were also to be considered to prevent restricting possible power line access routes to the substation.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document provides guidance on the safe distance that a wind turbine should be located from any Eskom power line or substation. The document specifies setback distances for transmission lines (220 kV to 765 kV), distribution lines (6.6 kV to 132 kV) and all Eskom substations. Setbacks for concentrated solar plants and photovoltaic plants are also specified away from substations.

2.1.1 Purpose

Setbacks for wind turbines and power lines / substations are required for various reasons. These include possible catastrophic failure of the turbine blade that may release fragments and which may be thrown onto nearby power lines that may result in damage with associated unplanned outages. Turbulence behind the turbine may affect helicopter flight during routine Eskom live line maintenance and inspections that may lead to safety risk of the aircraft / personnel. Concentrated solar plants and photovoltaic plants setback away from substations were required to prevent substations from being boxed in by these renewable generation plants limiting line route access to the substations.

2.1.2 Applicability

This document is applicable to the siting of all new and existing wind turbines, concentrated solar plants and photovoltaic plants near power lines and substations.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

1. http://www.envir.ee/orb.aw/class=file/action=preview/id=1170403/Hiiumaa+turbulence+impact+EMD.pdf.
2. http://www.energy.ca.gov/2005publications/CEC-500-2005-184/CEC-500-2005-184.PDF
3. http://www.adamscountywind.com/Revised%20Site/Windmills/Adams%20County%20Ordinance/Adams%20County%20Wind%20Ord.htm
4. http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=PA11R&RE=1&EE=1
5. http://www.wind-watch.org/documents/european-setbacks-minimum-distance-between-wind-turbines-and-habitations/
6. http://www.publications.parliament.uk/pa/ld201011/ldbills/017/11017.1-i.html
7. http://www.caw.ca/assets/pdf/Turbine_Safety_Report.pdf
8. Rogers J, Slegers N, Costello M. (2011) A method for defining wind turbine setback standards. Wind energy 10.1002/we.468

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
Setback	The minimum distance between a wind turbine and boundary line/dwelling/road/infrastructure/servitude etc.
Flicker	Effect caused when rotating wind turbine blades periodically cast shadows
Tip Height	The total height of the wind turbine ie. Hub height plus half rotor diameter (see Figure1)

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
None	

2.5 ROLES AND RESPONSIBILITIES

All personnel involved in the positioning wind turbines, concentrated solar plants and photovoltaic plants near power lines/substations must follow the setbacks outlined in this guideline.

2.6 PROCESS FOR MONITORING

Approval by Eskom in writing.

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. DOCUMENT CONTENT

3.1 INTERNATIONAL SETBACK COMPARISON

Wind Turbine setbacks employed by various countries were considered. It was found that setbacks were determined for various reasons that include noise, flicker, turbine blade failure and wind effects. The distances (setbacks) varied based on these factors and were influenced by the type of infrastructure

Wind turbine setbacks varied for roads, power lines, dwellings, buildings and property and it was noted that the largest setbacks were employed for reasons of noise and flicker related issues [1-7]. Very few countries specified setbacks for power lines.

The literature survey [1-7], yielded information about studies and experiments were conducted to determine the distance that a broken fragment from a wind turbine might be thrown. Even though of low probability of hitting a power line [5.0×10^{-5} [8]], the distances recorded were significant [750m [8]]

Setbacks were thus introduced to prevent any damage to Eskom infrastructure.

Wind turbines may also cause changes in wind patterns with turbulent effects behind the hub. These actors dictate the wind turbine setbacks specified in this document.

Concentrated solar plants and photovoltaic plants also can limit access into the substation for power lines of all voltages. A setback distance must therefore be employed to prevent the substation from being boxed in by these generation plants. These setback distances are specified in this document.

3.2 ESKOM REQUIRED SETBACKS

- Eskom requires a setback distance of 3 times the tip height of the wind turbine from the edge of the closest Eskom servitude (including vacant servitudes) for transmission lines.
- Eskom requires a setback distance of 1 times the tip height of the wind turbine from the edge of the closest Eskom servitude (including vacant servitudes) for distribution Lines.
- Eskom must be informed of any proposed wind turbine, concentrated solar plants and photovoltaic activity within a 5 km radius of a substation. No wind turbine structure shall be built within a 2 km radius of the closest point of the substation. Where concentrated solar plants and photovoltaic structures fall within a 2 km radius of the closest point of a substation, Eskom should be informed in writing during the planning phase of the construction of such plant or structure.
- Applicants must show that Eskom radio telecommunication systems (mainly microwave systems) will not be affected in any way by wind turbines.

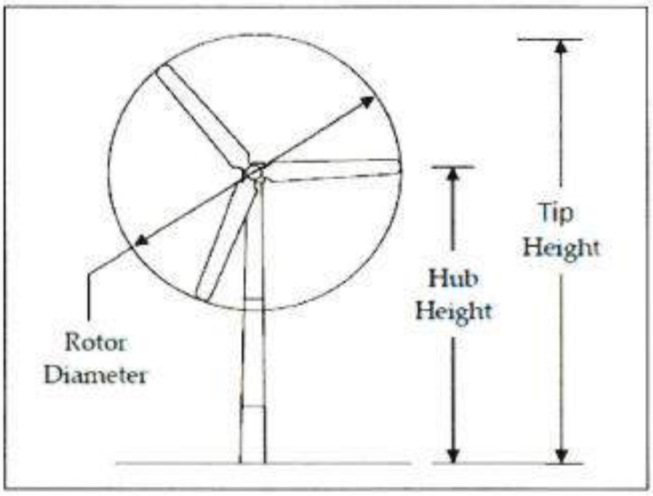


Figure 1: Horizontal Axis Wind Turbine [2]

4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
V Naidoo	Chief Engineer
Dr P H Pretorius	Electrical Specialist
J Geeringh	Snr Consultant Environ Mngt
B Haridass	Snr Consultant Engineer
R A Vajeth	Acting Snr Manager (Lines)

5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2013	0	J W Chetty	First Publication - No renewable energy generation plant setback specification in existence

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

Jonathan W Chetty (Mechanical Engineer)

Vivendhra Naidoo (Chief Engineer)

Dr Pieter H Pretorius (Electrical Specialist)

John Geeringh (Snr Consultant Environ Mngt)

Bharat Haridass (Snr Consultant Engineer)

Riaz A Vajeth (Acting Snr Manager (Lines))

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road · Arcadia · PRETORIA
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DEA Reference: 14/12/16/3/3/2/1034
Enquiries: Mmamohale Kabasa
Telephone: (012) 399 9420 **E-mail:** MKabasa@environment.gov.za

Ms Kelly Stroebel
Council for Scientific and Industrial Research (CSIR)
PO Box 320
STELLENBOSCH
7599

Telephone Number: (021) 888 2432
Email Address: kstroebel@csir.co.za

PER E-MAIL / MAIL

Dear Ms Stroebel

ACCEPTANCE OF THE SCOPING REPORT FOR THE PROPOSED 100MW SKEERHOK 2 PHOTOVOLTAIC SOLAR ENERGY FACILITY ON PORTION 9 OF THE FARM GEMSBOK BULT NO. 120 NORTH-EAST OF THE TOWN OF KENHARDT WITHIN THE !KHEIS LOCAL MUNICIPALITY IN THE NORTHERN CAPE PROVINCE

The Scoping Report (SR) and Plan of Study for Environmental Impact Assessment (PoSEIA) dated September 2017 and received by this Department on 03 November 2017 refers.

This Department has evaluated the submitted SR and the PoSEIA dated September 2017 and is satisfied that the documents comply with the minimum requirements of the Environmental Impact Assessment (EIA) Regulations, 2014. The SR is hereby accepted by the Department in terms of Regulation 22 (a) of the EIA Regulations, 2014.

You may proceed with the Environmental Impact Assessment process in accordance with the tasks contemplated in the PoSEIA and the requirements of the EIA Regulations, 2014.

All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAr and Environmental Management Programme (EMPr).

Please ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAr. This includes but is not limited to the provincial Northern Cape Department of Environment and Nature Conservation, the Department of Agriculture, Forestry and Fisheries (DAFF), Birdlife South Africa, the !Kheis Local Municipality, the ZF Mgcawu District Municipality, the Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), the SKA-SA, the Department of Environmental Affairs: Directorate Biodiversity and Conservation Unit and the Department of Environmental Affairs: Protected Areas Unit.

Please ensure that the EIAr and EMPr comply with Appendix 3 and Appendix 4 of Regulation 2014, as amended before submission to the Department. You are also required to address all issues raised by organs of state and I&APs prior to the submission of the EIAr to the Department.

Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.

The EAP must give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department.

In addition, the following:

i. The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.
ii. The listed activities represented in the EIAr and the application form must be the same and correct.
iii. Please ensure that all issues raised and comments received during the circulation of the Scoping Report from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity and Protected Areas Sections) in respect of the proposed activity are adequately addressed and included in the final EIAr. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014, as amended.
iv. A comments and response trail report (C&R) must be submitted with the final EIAr. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Annexure 1 of this comments letter.
v. The draft EIAr must provide an English translation of the copy of the newspaper advertisement placed in "Die Gemsbok" on 06 October 2017.
vi. The study area falls within the ambit of the Square Kilometre Array - South Africa. The impacts associated with radio frequency interference on the SKA must form part of the environmental impact assessment. The applicant must liaise with SKA-SA for advice on the terms of reference for the EMI and RFI detailed specialist studies and these studies must be completed, and included in the draft EIAr, with comments being obtained on these studies from the SKA-SA.
vii. Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.
viii. The following specialist studies have been identified to be conducted as part of the environmental impact assessment reports:
   - Ecological Impact Assessment (including Terrestrial Ecology): Simon Bundy of Sustainable Development Projects (SDP)
   - Avifauna Impact Assessment: Jon Smallie of Wild Skies Ecological Services
   - Visual Impact Assessment: Luanita Snyman-Van der Walt of CSIR
   - Heritage Impact Assessment (Archaeology and Cultural Landscape): Dr. Jayson Orton of ASHA Consulting (Pty) Ltd.
   - Desktop Palaeontological Impact Assessment: Dr. John Almond of Natura Viva cc
ix. Where specialist studies are conducted in-house or by a specialist other than a suitably qualified specialist in the relevant field, such specialist reports must be peer reviewed by a suitably qualified external specialist in the relevant field. Specifically, the Visual Impact Assessment to be conducted by the CSIR must be peer reviewed. The terms of reference for the peer review must include:
   - A CV clearly showing expertise of the peer reviewer;
   - Acceptability of the terms of reference;
   - Is the methodology clearly explained and acceptable;
   - Evaluate the validity of the findings (review data evidence);

- Discuss the suitability of the mitigation measures and recommendations;
- Identify any short comings and mitigation measures to address the short comings;
- Evaluate the appropriateness of the reference literature;
- Indicate whether a site-inspection was carried out as part of the peer review; and
- Indicate whether the article is well-written and easy to understand.

x. The specialist input referred to in comment (viii) of the comments on the draft scoping report signed 19 October 2017; must additionally address the following:
- Indicate whether the recommendation by the EAP that detailed studies are not required is acceptable;
- Indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable;
- Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated;
- Evaluate the appropriateness of the reference literature used;
- Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input;
- Indicate if the studies being referred to covers the preferred site; and
- Provide an indication on the cumulative impacts of these studies in relation to the proposed development.
- Must be conducted or input provided on by a suitably qualified specialist in the field.

xi. Due to the number of similar applications in the area, all the specialist assessments must include a cumulative environmental impact assessment for all identified and assessed impacts. The cumulative impact assessment must indicate the following:
- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.
- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.

xii. The cumulative impacts on SKA must also be assessed for and considered in the EIAr.

xiii. All communications and correspondences between the EAP and SKA-SA must be included in the EIAr.

xiv. The impacts on the proposed battery storage facility must be adequately assessed. Furthermore, it is noted that the activity applied for the battery storage has a threshold of between 80m³ to 500m³, whereas, the proposed battery storage facility will have a capacity of 1120m³. As such, the correct listed activity must be applied for and all the impacts related to the battery storage facility, including specialist studies if any must be conducted and assessed.

xv. The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for solar energy facilities below.

xvi. The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.

xvii. The EIAr must provide the following:
- Clear indication of the envisioned area for the proposed solar energy facility; i.e. placing of photovoltaic panels and all associated infrastructure should be mapped at an appropriate scale.
- Clear description of all associated infrastructure. This description must include, but is not limited to the following:
  - Power lines;
  - Internal roads infrastructure; and;

- All supporting onsite infrastructure such as laydown area, guard house and control room etc.
- All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation.

xviii. The EIAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations.

xix. Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.

xx. The EIAr must provide a detailed description of the need and desirability, not only providing motivation on the need for clean energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites.

xxi. A copy of the final site layout map and alternatives. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following:
- PV positions and its associated infrastructure;
- Permanent laydown area footprint;
- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure;
- Substation(s) and/or transformer(s) sites including their entire footprint;
- Connection routes (including pylon positions) to the distribution/transmission network;
- All existing infrastructure on the site, especially roads;
- Buffer areas;
- Buildings, including accommodation; and
- All "no-go" areas.

xxii. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.

xxiii. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.

xxiv. A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to:

Postal Address:
Department of Environmental Affairs
Private Bag X447
Pretoria, 0001

Physical address:
Environment House
473 Steve Biko Road
Pretoria

For Attention: Muhammad Essop
Integrated Environmental Authorisations
Strategic Infrastructure Developments
Telephone Number: (012) 399 9406
Email Address: MEssop@environment.gov.za

The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:

i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.
ii. The final site layout map.
iii. Measures as dictated by the final site layout map and micro-siting.
iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.
vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.
viii. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
ix. An open space management plan to be implemented during the construction and operation of the facility.
x. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
xi. A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment.
xii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must 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 must promote the dissipation of storm water run-off.
xiii. A fire management plan to be implemented during the construction and operation of the facility.
xiv. An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
xv. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.
xvi. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.

The EAP must provide the final detailed Site Layout Plan as well as the final EMPr for approval with the final EIAr as this Department needs to make a decision on the EA, EMPr and Layout Plan.

Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.

You are hereby reminded that should the EIAr fail to comply with the requirements of this acceptance letter, as well as the requirements of the EIA Regulations, 2017, the project will be **refused** in accordance with Regulation 24(1)(b) of the EIA Regulations, 2014.

The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in Regulation 43(1).

Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr.

You are requested to submit two (2) electronic copies (DVD and USB) and one (1) hard copies of the EIAr to the Department.

Please also find attached information that must be used in the preparation of the EIAr. This will enable the Department to speedily review the EIAr and make a decision on the application.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, which stipulates that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Yours faithfully

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter Signed by: Coenrad Agenbach
Designation: Deputy Director: Strategic Infrastructure Developments
Date: 30/11/2017

cc:	C Forster	Juwi Renewable Energies (Pty) Ltd	Email: cleo.forster@juwi.co.za
	O Riba	Northern Cape DENC	Email: ORiba@ncpg.gov.za/ oriba.denc@gmail.com
	J Essau	!Kheis Local Municipality	Email: Jenkins.esau@gmail.com

6

Annexure 1

Format for Comments and Response Trail Report:

Date of comment, format of comment name of organisation/I&AP,	Comment	Response from EAP/Applicant/Specialist
27/01/2016 Email Department of Environmental Affairs: Strategic Infrastructure Development (John Soap)	Please record C&R trail report in this format Please update the contact details of the provincial environmental authority	EAP: ~~(Noted)~~The C&R trail report has been updated into the desired format, see Appendix K EAP: Details of provincial authority have been updated, see page 16 of the Application form

A. EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES

1. General site information

The following general site information is required:

- Descriptions of all affected farm portions
- 21 digit Surveyor General codes of all affected farm portions
- Copies of deeds of all affected farm portions
- Photos of areas that give a visual perspective of all parts of the site
- Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)
- Solar plant design specifications including:
  - Type of technology
  - Structure height
  - Surface area to be covered (including associated infrastructure such as roads)
  - Structure orientation
  - Laydown area dimensions (construction period and thereafter)
  - Generation capacity
- Generation capacity of the facility as a whole at delivery points

This information must be indicated on the first page of the EIAr. It is also advised that it be double checked as there are too many mistakes in the applications that have been received that take too much time from authorities to correct.

2. Sample of technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	
Area of PV Array	
Number of inverters required	
Area occupied by inverter / transformer stations / substations	
Capacity of on-site substation	
Area occupied by both permanent and construction laydown areas	
Area occupied by buildings	

7

Length of internal roads	
Width of internal roads	
Proximity to grid connection	
Height of fencing	
Type of fencing	

3. Site maps and GIS information

Site maps and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map/layer must be provided that includes the following:
  - Current use of land on the site including:
    - Buildings and other structures
    - Agricultural fields
    - Grazing areas
    - Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
    - Critically endangered and endangered vegetation areas that occur on the site
    - Bare areas which may be susceptible to soil erosion
    - Cultural historical sites and elements
  - Rivers, streams and water courses
  - Ridgelines and 20m continuous contours with height references in the GIS database
  - Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs
  - High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
  - Buffer zones (also where it is dictated by elements outside the site):
    - 500m from any irrigated agricultural land
    - 1km from residential areas
  - Indicate isolated residential, tourism facilities on or within 1km of the site
- A slope analysis map/layer that include the following slope ranges:
  - Less than 8% slope (preferred areas for PV and infrastructure)
  - between 8% and 12% slope (potentially sensitive to PV and infrastructure)
  - between 12%and 14% slope (highly sensitive to PV and infrastructure)
  - steeper than 18 % slope (unsuitable for PV and infrastructure)
- A site development proposal map(s)/layer(s) that indicate:
  - Foundation footprint
  - Permanent laydown area footprint
  - Construction period laydown footprint
  - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
  - River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
  - Substation(s) and/or transformer(s) sites including their entire footprint.
  - Cable routes and trench dimensions (where they are not along internal roads)
  - Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM)

- ➢ Cut and fill areas at PV sites along roads and at substation/transformer sites indicating the expected volume of each cut and fill
- ➢ Borrow pits
- ➢ Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
- ➢ Buildings including accommodation

With the above information authorities will be able to assess the strategic and site impacts of the application.

4. Regional map and GIS information

The regional map and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - ➢ roads including their types (tarred or gravel) and category (national, provincial, local or private)
  - ➢ Railway lines and stations
  - ➢ Industrial areas
  - ➢ Harbours and airports
  - ➢ Electricity transmission and distribution lines and substations
  - ➢ Pipelines
  - ➢ Waters sources to be utilised during the construction and operational phases
  - ➢ A visibility assessment of the areas from where the facility will be visible
  - ➢ Critical Biodiversity Areas and Ecological Support Areas
  - ➢ Critically Endangered and Endangered vegetation areas
  - ➢ Agricultural fields
  - ➢ Irrigated areas
  - ➢ An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams

5. Important stakeholders

Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Any application, documentation, notification etc. should be forwarded to the following officials:

Ms Mashudu Marubini
Delegate of the Minister (Act 70 of 1970)
E-mail: MashuduMa@daff.gov.za
Tel 012- 319 7619

Ms Thoko Buthelezi
AgriLand Liaison office
E-mail: ThokoB@daff.gov.za
Tel 012- 319 7634

All hardcopy applications / documentation should be forwarded to the following address:

Physical address:
Delpen Building
Cnr Annie Botha and Union Street
Office 270

Attention: Delegate of the Minister Act 70 of 1970

Postal Address:
Department of Agriculture, Forestry and Fisheries
Private Bag X120
Pretoria
0001
Attention: Delegate of the Minister Act 70 of 1970

In addition, comments must be requested from Eskom regarding grid connectivity and capacity. Request for comment must be submitted to:

Mr John Geeringh
Eskom Transmission
Megawatt Park D1Y38
PO Box 1091
JOHANNESBURG
2000

Tel: 011 516 7233
Fax: 086 661 4064
John.geeringh@eskom.co.za

3. AGRICULTURE STUDY REQUIREMENTS

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point
  - Soil colour
  - Limiting factors
  - Clay content
  - Slope of the site
  - A detailed map indicating the locality of the soil forms within the specified area,
  - Size of the site
- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)
- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map.

C. ASTRONOMY GEOGRAPHIC ADVANTAGE ACT, 2007 (ACT NO. 21 OF 2007)

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

- You are requested to indicate the applicability of the Astronomy Geographic Advantage Act, Act No. 21 of 2007 on the application in the BAR/EIR. You must obtain comments from the Southern African Large Telescope (SALT) if the proposed development is situated within a declared astronomy advantage area.

Square Kilometre Array (SKA) SA

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SKA AFRICA
SQUARE KILOMETRE ARRAY

Cleo Forster
Project Development Manager
Juwi Renewable Energy
Metropolitan Centre
7 Walter Sisulu Avenue
Cape Town
8001

Email: cleo.forster@juwi.co.za

6th February 2018

Dear Cleo,

Re: Development of Skeurhok PV Facility – Phase 1, 2 and 3

This letter is in response to your email request to provide an assessment on the potential development of the proposed Skeurhok PV Facility, to be established in three phases, and the risk it may pose on the Square Kilometre Array Project.

As input into this assessment, you have provided SKA South Africa (otherwise known as the South African Radio Astronomy Observatory) with detailed impact assessments, for each of the three phases, undertaken by an EMC consultant ITC Services. These assessment took into account a historical assessment that considered the cumulative impact of facilities proposed to be established at this same location, prepared by MESA Solutions.

An assessment of the detailed impact assessment has been conducted by SKA South Africa. This letter serves to confirm the outcomes of this assessment.

i. The detailed impact assessment includes a technology risk assessment, radio frequency measurements undertaken within a laboratory environment, and measurements undertaken at a representative photovoltaic facility (Dreunberg);
ii. The assessment for Skeurhok Phase 1 indicates that, based on the measurement data available and assuming up to six similar facilities in the vicinity are established, up to 20dB of attenuation will

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be required to ensure no interference with the SKA (should only one facility be established in the vicinity, this would reduce to 12 dB);

iii. The assessment for Skeurhok Phase 2 indicates that, based on the measurement data available and assuming up to six similar facilities in the vicinity are established, up to 40dB of attenuation will be required to ensure no interference with the SKA (should only one facility be established in the vicinity, this would reduce to 32 dB);

iv. The assessment for Skeurhok Phase 3 indicates that, based on the measurement data available and assuming up to six similar facilities in the vicinity are established, up to 35dB of attenuation will be required to ensure no interference with the SKA (should only one facility be established in the vicinity, this would reduce to 27 dB);

v. Based on the assessments for all three phases, the required attenuation as identified above would be applied, primarily, to the tracker systems that are identified in the technology risks;

vi. It is likely that additional risks may be identified during the detailed design process of the facilities, such as design decisions concerning specific suppliers of equipment. These risks may result in a different RFI risk profile that needs to be accommodated during the design and construction of the proposed facilities;

vii. SKA South Africa supports the view that the required attenuation is achievable following appropriate design decisions and implementation of mitigation measures. In order to ensure that the identified risk of interference is mitigated, SKA South Africa requires that, as a special condition to environmental authorisations that may be considered for any, or all, of the proposed facilities, Juwi Renewable Energy be required to prepare and submit an EMC (Electromagnetic Compatability) Control Plan to SKA South Africa for approval prior to any detailed design and construction activities associated with the proposed facilities. This EMC Control Plan shall prescribe the manner in which Juwi shall achieve the required protection, including appropriate acceptance testing and verification processes prior to any construction activities of the proposed facilities being initiated.

This technical advice is provided by the South African SKA Project Office on the basis of the protection requirements of the SKA in South Africa, and does not constitute legal approval of the renewable energy projects in terms of the Astronomy Geographic Advantage Act, the Management Authority, and its regulations or declarations.

www.ska.ac.za

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Karoo Support Base
P.O. Box 69 Carnarvon, 8925
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Regards,

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DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX H:

Comments and Responses Trail

COMMENTS AND RESPONSES TRAIL

This chapter presents the comments that were raised by stakeholders, I&APs and Organs of State during the preceding **Scoping Phase (including acceptance of Scoping from DEA)**, and responses to the comments and, if applicable, how these comments have been addressed in this EIA Phase. It is important to note that no comments were raised by stakeholders, I&APs or Organs of State following the submission of the finalised Scoping Report to the DEA for decision-making (in November 2018) and prior to the release of this Draft EIAR for a 30-day review period.

IDENTIFICATION OF ISSUES

An important element of the EIA Process is to evaluate the issues raised through the interactions with authorities, the public, the specialists on the EIA team and the project proponent. In accordance with the philosophy of Integrated Environmental Management, it is important to focus the EIA on the key issues, such as those issues that are considered critical for decision-making on the EA.

To assist in the identification of key issues, a decision-making process is applied to the issues raised, based on the following criteria:

- Whether or not the issue falls within the scope and responsibility of the proposed project; and
- Whether or not sufficient information is available to respond to the issue raised without further specialist investigation.

Issues were sourced by the EIA team from the following Scoping interactions:

- **Newspaper Advertisement** - In order to inform the public of the proposed project and invite members of the public to register as I&APs, and to inform the EIA consultant about specific issues or interests in the proposed project, the proposed Solar PV projects and EIA Processes were advertised in one local newspaper (i.e. “Gemsbok”) on the 4th October 2017 (the newspaper is dated 6th October, but was distributed on 4th October 2017) during the Scoping Phase. A copy of the newspaper advertisement is included in Appendix D of this EIA Report.
- **Site Notices** – site notices describing the project as well as the contact details of the EAP were placed at several locations on site and nearby, as seen in Appendix F.
- **Email** – Emails were sent out as part of the public participation process undertaken for the 30-day review of the Draft Scoping Report (18 September 2017). Proof of this correspondence can be seen in Appendix E.

All comments received during the 30-day review of the Scoping Report for I&AP review are included in the Comments and Responses Table below, as well as in Appendix G of this EIA Report.

All comments received during the 30-day review of the Draft EIAR for I&AP review will be included in the Comments and Responses Table in the Final EIA report as well as in Appendix G of the Final EIAR. In addition to the comments and responses being in the tables below following the Draft EIAR review, all commenting I&APs will receive an email response from the EAP/Applicant.

The tables below summarise the comments and/or issues raised following the release of the Draft Scoping Report for I&AP review, together with a response from the EIA team, as well as comments included in the acceptance of the Scoping Report letter (dated 30/11/2017) received from the Competent Authority. Copies of the comments received are included in **Appendix G** of this EIA Report.

Table 1: Comments received following the release of the Draft Scoping Report for the 30-day review period, together with the response from the EIA team

*Please note that the comments are taken verbatim from the comments provided by I&APs

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
1.	Due to short notice, there is not enough time to go through the documentation. However, I would like to highlight some aspects that must be considered and responded to: 1. Should any impact occur within a CBA area (2017 version) within the Northern Cape, it will trigger a biodiversity offset. Accordingly, a biodiversity status assessment report must be prepared as well for consideration. 2. Confirmation must be obtained from SKA that the development planned will not negatively effect SKA activities or plans, nor will it be within their declared spatial area declared in Government Gazette.	*Elsabe Swart, Northern Cape Department of Tourism, Environment and Conservation*	20 September 2017, Email	**CSIR:** **Thank you for your comments.** Please see responses below numbered according to your comment: **1.** Thank you for noting this, however, the project does not fall within a CBA. The full ecological impact assessment will be included in the EIAR and will include any biodiversity impacts, should there be any. **2.** Please see **Chapter 7, Section 7.8.6** for the Terms of Reference for the SKA RFI study that has been undertaken. The full results of which will be included in the EIAR and a comment from the SKA on the development included. *Note: Comment was also responded to by the EAP via email on 27/10/2017*
2.	Please note that the applications for EA as well as the Draft Scoping Report will only be acknowledged upon receipt and after the application was screened and a reference number is allocated. Note that applications will only be accepted at	*EIA Admin, National Department of Environmental Affairs*	20 September 2017, Email	**CSIR:** This has been noted, thank you.

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	Reception during DEA official office hours. The documents were however received by the Department.			
3.	The Department confirms having received the application for Environmental Authorisation and Draft Scoping Report for the abovementioned project on 19 September 2017. You have submitted these documents to comply with the Environmental Impact Assessment (EIA) Regulations, 2014, as amended. Please take note of Regulation 40(30) of the EIA Regulations, 2014, as amended, which states that potential Interested & Affected Parties, including the Competent Authority, may be provided with an opportunity to comment on reports and plans contemplated in Regulation 40(1) of the EIA Regulations, 2014, as amended, prior to the submission of an application but must be provided an opportunity to comment on such reports once an application has been submitted to the Competent Authority. Note that in terms of Regulation 45 of the EIA Regulations, 2014, as amended, this application will lapse if the applicant fails to meet any of the time-frames prescribed in terms of these Regulations, unless an extension has been granted by the Department in terms of Regulation 3(7) of the EIA Regulations, 2014, as amended. You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an	*Mr Sabelo Malaza, National Department of Environmental Affairs*	21 September 2017, Email	**CSIR:** Thank you for taking the time to acknowledge the application and the recommended actions will be undertaken accordingly.

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	Environmental Authorisation being granted by the Department.			
4.	Can you please send me the KMZ links for the 3x proposed project sites and power corridor to the sub station.	*Claude Bosman, Veroniva (Pty) Ltd - Energy*	21 September 2017, Email	**CSIR:** The KMZ links were sent through to the commentator on 21/09/2017 via email and receipt acknowledged.
	Your enquiry regarding approval from the SACAA with regard to PV farms refers. There is a SACAA process whereby permission is applied for wrt obstacles which could pose an aviation hazard. More information can be obtained at http://www.caa.co.za. Click on information for industry 'Obstacles' on the LHS. Forms, Part 139-27 and submit on the form itself. • Kindly provide a .kml (Google Earth) file reflecting the footprint of the proposed development site including the proposed overhead electric power line route that will evacuate the generated power to the national grid. • Also indicate the highest structure of the project & the Overhead electric power transmission line. • Note that there may be other wind farms and PV farms in the area. Unique names are preferable. • Please always use the proposed PV farm name in the Subject box when corresponding via email with this office and indicate the name & address which should appear on the CAA approval/decline letter. • There is an assessment fee of R820 per	*Lizelle Stroh, South African Civil Aviation Authority*	21 September 2017, Email	**CSIR:** Thank you for this comment. An application to SACAA and proof thereof will be done in the EIA phase. *Note: Comment was also responded to by the EAP via email on 27/10/2017*

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	application. • For billing purposes: company name VAT nr. and postal details. • Kindly ensure that all the above data is forwarded. Incomplete data causes unnecessary delays.			
5.	It seems that the Sishen – Saldanha Iron Ore line (between Kenhardt – Rugseer) will not be directly affected by this proposal. This office in principle has no objection to the proposed application.	*Jaco Hanekom, Transnet*	22 September 2017, Email	**CSIR:** Thank you for this comment it is noted. *Note: Comment was also responded to by the EAP via email on 27/10/2017*
6.	Please find attached Eskom requirements for works at or near Eskom infrastructure. Please send me KMZ files of the development and proposed grid connection when available.	*John Geeringh, Eskom*	28 September 2017, Email	**CSIR:** Thank you for these requirements, they will be incorporated into the project design as well as the impact assessment. *Note: Comment was also responded to by the EAP via email on 27/10/2017* KMZ files were sent to the commentator on 10/10/2017 and acknowledgement of receipt email was received by CSIR.
7.	<u>This Department has the following comments on the abovementioned application</u>: **i.** Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in	*Sabelo Malaza, National Department of Environmental Affairs*	19 October 2017, Email and Post	**CSIR:** Thank you for your comments, please see responses below as per your corresponding numbering: i. This is noted and agreed.

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	the project description. **ii.** If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms. **iii.** The final SR must provide evidence that all relevant and identified competent authorities have been given an opportunity to comment on the proposed development. **iv.** Please ensure that all issues raised and comments received during the circulation of the SR from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed in the final SR. Proof of correspondence with the various stakeholders must be included in the final SR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014, as amended. **v.** Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives			ii. This is noted and agreed. iii. Please see Appendix E for proof of correspondence to I&APs, Appendix C for the I&AP database and Appendix G for copies of the comments from I&APs. Please note that an application for this project has been created on SAHRIS (including the report attached as Appendix K), with the **Case ID: 11818.** No comments had been received by SAHRA at the date of submission of the FSR. iv. Please see response above. All comments have been responded to in this Appendix. v. Please see Chapter 5 for a description of any identified alternatives for the proposed activity that are feasible and reasonable, as per Appendix 2 of the EIA Regulations, 2014, as amended. vi. A hydrological comment has been included in Chapter 3, Section 3.3.8 Aquatic Environment (Surface Water, Drainage, and Wetland Ecosystems). A full hydrological study will be included in the EIAR. vii. Please see **Chapter 7, Section 7.8.6** for the ToR's of the SKA RFI Study. The full study and SKA engagement will be included in the EAIR. viii. Please see **Chapter 6** for confirmation that

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	will have on the environment and on the community that may be affected by the activity as per Appendix 2 of the EIA Regulations, 2014, as amended. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2. **vi.** It is noted that the following activities that occur within watercourses have been applied for: G.NR. 983 Activities 12(x) and (xii); and 19(i). A separate hydrological assessment to assess the impacts on the surface hydrology of the proposed development area is required. The hydrological assessment to be conducted must assess, inter alia the following: ➢ Identification and sensitivity rating of all surface water courses for the impact phase of the proposed development; ➢ Identification, assessment of all potential impacts to the water courses and suggestion of mitigation measures; and, ➢ Recommendations on the preferred placement of the facility and all associated infrastructure and preference must be provided to the avoidance of the watercourses on the property. vii. The study area falls within the ambit of the Square Kilometre Array - South Africa. The impacts associated with radio frequency interference on the SKA must form part of the environmental impact assessment. The Department notes that the EAP and applicant have initiated engagements with the SKA-SA on this matter. The Department urges the EAP to ensure that the ToR for the study, should there be one necessary, be			impact statements will be done in the EIAR using existing information in the area for the following: social, agricultural, traffic. With regards to palaeontology, this will be assessed as part of the Heritage/Archaeology study in the EIA phase. Chapter 6 has been updated to reflect this information. ix. Please see **Chapter 1- EIA Team** for the inclusion of the names of the specialists. x. Please see **Chapter 7, section 7.8** for the updated ToR's as per this comment. xi. This is noted and agreed. xii. This is noted and will be abided to if applicable. xiii. Please see **Appendix B** for the EAP declaration under oath. xiv. Please see **Chapter 1, Section 1.6** and **Appendix A.** xv. Please see **Chapter 1, Table 1.6** for a checklist of requirements of a Scoping Report as defined in terms of Appendix 2 of GN R326. xvi. This is noted. *Note: Comment was also responded to by the EAP via*

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	included in the final scoping report. **viii.** <u>The Department notes that the EAP recommends that full specialist studies not be conducted during the EIA process for impacts associated with: palaeontology, agriculture, social and traffic. The Department requires that a suitably qualified specialist provide an environmental impact statement in this regard. The impact statement must also advise on cumulative impacts as a result of the above-mentioned impacts.</u> **ix.** You are hereby advised that the final SR must provide the names of the specialists that will conduct the various studies as outlined in the PoSEIA. **x.** The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: ➢ A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisations. ➢ Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed. ➢ Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the 'no-go' areas.			*email on 27/10/2017*

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	➢ Should the specialist definition of 'no-go' area differ from the Department's definition; this must be clearly indicated. The specialist must also indicate the 'no-go' areas buffer if applicable. ➢ All specialist studies must be final, and provide detailed/practical mitigation measures and recommendations, and must not recommend further studies to be completed post EA. ➢ Clearly defined cumulative impacts and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. ➢ A detailed process flow to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. ➢ Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology approved with the acceptance of the scoping report. ➢ The significance rating must also inform the need and desirability of the proposed development. ➢ A cumulative impact environmental statement on whether the proposed development must proceed. **xi.** Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.			

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	xii. Where specialist studies are conducted in-house or by a specialist other than a suitably qualified specialist in the relevant field, such specialist reports must be peer reviewed by a suitably qualified external specialist in the relevant field. The terms of reference for the peer review must include: ➢ A CV clearly showing expertise of the peer reviewer; ➢ Acceptability of the terms of reference; ➢ Is the methodology clearly explained and acceptable; ➢ Evaluate the validity of the findings (review data evidence); ➢ Discuss the suitability of the mitigation measures and recommendations; ➢ Identify any short comings and mitigation measures to address the short comings; ➢ Evaluate the appropriateness of the reference literature; ➢ Indicate whether a site-inspection was carried out as part of the peer review; and ➢ Indicate whether the article is well-written and easy to understand. **xiii.** In terms of Appendix 2 of the EIA Regulations, 2014, as amended, the report must include an undertaking under oath or affirmation-by the EAP in relation to: - the correctness of the information provided in the reports; - the inclusion of comments and inputs from stakeholders and I&APs;			

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	- the inclusion of inputs and recommendations from the specialist reports where relevant; - any information provided by the EAP to I&APs; and - responses by the EAP to comments or inputs made by I&APs. **xiv.** The affirmation of oath by the EAP must be witnessed and signed by a commissioner of oath. **xv.** In accordance with Appendix 2 of the EIA Regulations 2014, as amended, the details of- *(i) the EAP who prepared the report; and* *(ii) the expertise of the EAP to carry out Scoping and Environmental impact assessment procedures;* must be submitted. **xvi.** You are further reminded that the final SR to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of scoping reports in accordance with Appendix 2 and Regulation 21(1) of the EIA Regulations, 2014, as amended. Further note that in terms of Regulation 45 of the EIA Regulations 2014, as amended, this application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of the these Regulations, unless an extension has been granted in terms of Regulation 3(7). You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998,			

NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.			
	2. BACKGROUND AND COMMENTS ON DRAFT SCOPING REPORT The directorate: Biodiversity Conservation received and evaluated the DSR for the above mentioned project and based on the information provided, the project will have more terrestrial and aquatic ecological impacts, both during construction and operational phases. <u>Construction Phase</u> ➢ The proposed development will cause more disturbance on fauna, refugia and general change in habitat. ➢ The increased electrical light pollution will lead to changes in nocturnal behavioural patterns amongst faunal activities. ➢ Alteration in surface drainage patterns on account of construction activities will lead to rapid change in plant communities and general habitat structure both within the site and immediately adjacent to site. ➢ Alteration of surface water quality on account of construction activities will lead to changes in water chemistry. <u>Operational Phase</u> ➢ Increased shading of vegetation 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.	*Wilma Lutsch Director: Biodiversity Conservation Department of Environmental Affairs*	13 October 2017, Email	**CSIR:** **Thank you for taking the time to comment.** Please see below responses to your recommendations: ➢ Please see Chapter 3, Section 3.3.7 and Section 3.4 for a scoping assessment of the biodiversity concerns of the site. A full biodiversity Specialist Impact assessment will be included in the EIAR. ➢ Please see Chapter 3, Section 3.3.7 and Section 3.4 for a scoping assessment of the aquatic concerns of the site. A full biodiversity Specialist Impact assessment will be included in the EIAR. **Please see the specialist response below** **Mr. Simon Bundy:** "After site reconnaissance, the proposed development area(s) will not encroach on to any wetlands, streams or rivers. Shallow dendritic drainage features, common to the region have been identified that are related to the prevailing geology and in some cases the movement of livestock. These features lack the edaphics, morphology and botanical habitat that would identify them as riparian or aquatic in function, however they will be considered from an ecological perspective within that report during the EIA process" ➢ Please see **Chapter 7, Section 7.5** for the approach to impact assessment which follows hierarchy: (1) avoidance, (2) minimization, (3)

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<tr><th>NO.</th><th>COMMENTS</th><th>COMMENTATOR</th><th>DATE</th><th>RESPONSE</th></tr>
<tr><td></td><td>➢ The fencing of the site, possibly with electric fencing, is likely to impact upon faunal behaviour, leading to the exclusion of certain species and possible mortalities.
➢ Abstraction of ground water for the cleaning of modules will alter the state of sub-surface water resources.

3. RECOMMENDATIONS

After reviewing and evaluating the potential impacts of the project on flora and faunal species, it is recommended that the following be included in the final Scoping Report (FSR).
➢ Biodiversity Specialist Impact Assessment is recommended to be included in the FSR in order to validate the predicted impacts and significance of the Skeerhok PV 2, as well as to propose any relevant mitigation measures.
➢ Aquatic Specialist impact Assessment must be compiled and submitted during the FSR.
➢ Mitigation options must be considered in terms of the following hierarchy: (1) avoidance, (2) minimization, (3) restoration and (4) offsets.
➢ The Critical Biodiversity Areas map must be submitted indicating all efficient selection and classification of land portions requiring protection and maintenance.
➢ The cumulative impacts of the area must be assessed and included in the final Scoping phase.
➢ An EMPr with full Operational Plan as well as any additional information that is outstanding as stated in the draft scoping report should be provided.</td><td></td><td></td><td>restoration and (4) offsets.
➢ Please note that the project does not fall within a Critical Biodiversity Area. More detailed information on this can be seen in Chapter 3, Section 3.2.
➢ Please note that the specialists reports which will form part of the EIAR will assess cumulative impacts.
➢ Please note EMPr with full Operational Plan will be provided in the Draft EIAR.

Note: Comment was also responded to by the EAP via email on 27/10/2017</td></tr>
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NO.	COMMENTS	COMMENTATOR	DATE	RESPONSE
	4. CONCLUSION The Directorate: Biodiversity Conservation has reviewed the submitted DSR and recommends that the above mentioned recommendations be included on the final scoping phase.			

Table 2: Comments included in the Acceptance of Scoping Letter following the submission of the final Scoping Report to the Competent Authority, together with the response from the EIA team.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
30/11/2017 Email Department of Environmental Affairs: Strategic Infrastructure Development (Sabelo Malaza)	This Department has evaluated the submitted SR and the PoSEIA dated September 2017 and is satisfied that the documents comply with the minimum requirements of the Environmental Impact Assessment (EIA) Regulations, 2014. The SR is hereby accepted by the Department in terms of Regulation 22 (a) of the EIA Regulations, 2014. You may proceed with the Environmental Impact Assessment process in accordance with the tasks contemplated in the PoSEIA and the requirements of the EIA Regulations, 2014. All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAr and Environmental Management Programme (EMPr). Please ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAr. This includes but is not limited to the provincial Northern Cape Department of Environment and Nature Conservation, the Department of Agriculture, Forestry and Fisheries (DAFF), Birdlife South Africa, the IKheis Local Municipality, the ZF Mgcawu District Municipality, the Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAH RA), the SKA-SA, the Department of Environmental Affairs: Directorate Biodiversity and Conservation Unit and the Department of Environmental	**CSIR:** Thank you for these comments. Please see responses below as per your corresponding numbering: All opening remarks are noted and agreed with. i. The Final EIAr will reflect the listed activities that are being assessed. Should this differ from the application form, an amended application form will be submitted with the FEIR. ii. Please see comment above in response. iii. This Chapter (Appendix H) includes all comments received from I&APs during the scoping process to date. Please see Appendix C for the I&AP database which includes all stakeholders that were notified of the review period on the reports. Proof of correspondence with the stakeholders can be seen in Appendix E. Chapter 4, Section 4.4 details the public participation process for this project followed as per Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014, as amended. iv. This Appendix (Appendix H) constitutes the Comments and Responses Report, using the format as indicated in the aforementioned letter. v. Please see Appendix D, Page 3, for the English

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	Affairs: Protected Areas Unit. Please ensure that the EIAr and EMPr comply with Appendix 3 and Appendix 4 of Regulation 2014I as amended before submission to the Department. You are also reguired to address all issues raised by organs of state and I&APs prior to the submission of the EIAr to the Department. Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The EAP must give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department. In addition, the following: i. The ElAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for. ii. The listed activities represented in the ElAr and the application form must be the same and correct. iii. Please ensure that all issues raised and comments received during the circulation of the Scoping Report from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity and Protected Areas Sections) in respect of the proposed activity are adequately addressed and included in the final ElAr. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014, as	version of the Newspaper Advertisement placed in "Die Gemsbok" on 06 October 2017. vi. Please refer to Chapter 4, Section 4.7.6 for the ToR of the RFI Study. The RFI study, inclusive of all findings, is attached to this Draft EIAR as Appendix P. vii. Chapter 7 (Conclusions) summarises all the recommendations from the specialists, as well as the overall recommendation of the EAP. viii. This is correct. Please see Appendices I to N for an inclusion of the specialist studies and statements. ix. Please kindly see Appendix M for the VIA, as well as the details of the external reviewer (SiVEST). The review included a review summary letter which stipulated the required information as per the DEA's requirements, and the reviewer's response. It must be noted that the recommendations for edits to be made to the VIA **have been made** post external review. Appendix M reflects those requested changes by SiVEST. x. The Impact Statements for Social, Traffic and Agriculture were compiled by the CSIR using the extensive information available in the study area. These statements have been reviewed by qualified specialists in the field, and the details of this review is included in each statement, attached as Appendix N. The specialists commented on all of the listed required information as per your comment in a tabular

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	amended. iv. A comments and response trail report (C&R) must be submitted with the final EIAr. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Annexure 1 of this comments letter. v. The draft EIAr must provide an English translation of the copy of the newspaper advertisement placed in “Die Gemsbok" on 06 October 2017. vi. The study area falls within the ambit of the Square Kilometre Array - South Africa. The impacts associated with radio frequency interference on the SKA must form part of the environmental impact assessment. The applicant must liaise with SKA-SA for advice on the terms of reference for the EMI and RFI detailed specialist studies and these studies must be completed, and included in the draft EIAr, with comments being obtained on these studies from the SKA-SA. vii. Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice. viii. The following specialist studies have been identified to be conducted as part of the environmental impact assessment reports: ➢ Ecological Impact Assessment (including Terrestrial Ecology): Simon Bundy of Sustainable Development Projects (SDP) ➢ Avifauna Impact Assessment: Jon Smallie of Wild Skies Ecological Services ➢ Visual Impact Assessment: Luanita Snyman-Van der Walt of CSIR ➢ Heritage Impact Assessment (Archaeology and Cultural Landscape): Dr. Jayson Orton of ASHA Consulting (Pty) Ltd. ➢ Desktop Palaeontological Impact Assessment: Dr. John Almond of Nature Viva cc ix. Where specialist studies are conducted in-house or by a specialist other than a suitably qualified specialist in the relevant field, such specialist	format in the introduction to the statements. xi. Please see each specialist study attached as Appendix I to N for an assessment of the cumulative impacts as per your comment. In addition, Chapter 6 and 7 include an assessment of the cumulative impacts. xii. Please see the RFI study attached as Appendix P, where consideration of the other renewable energy applications on the SKA have been assessed. xiii. Please see Appendix G and O for comment from SKA on this application (and other two Skeerhok Applications). xiv. Kindly refer to Appendix O for the correspondence between the Applicant and DEA confirming that the battery storage does not trigger a listed activity as well as any additional risk assessments. In addition, please see Chapter 2, Section 2.3 for further details regarding the risks of this activity. xv. Please refer to Chapter 2 – Project Description – for this completed table. xvi. Please refer to Chapter 2, Table 2.1 and Figure 2.1 for a map and table of the corner co-ordinates of the site. xvii. Please refer to Chapter 2, Figures 2-1, 2-2 and 2-3 for the maps inclusive of these details. xviii. Chapter 4, Section 4.4 details the public participation process for this project followed as per Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014, as amended.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	reports must be peer reviewed by a suitably qualified external specialist in the relevant field. Specifically, the Visual Impact Assessment to be conducted by the CSIR must be peer reviewed. The terms of reference for the peer review must include: ➢ A CV clearly showing expertise of the peer reviewer; ➢ Acceptability of the terms of reference; ➢ Is the methodology clearly explained and acceptable; ➢ Evaluate the validity of the findings (review data evidence); ➢ Discuss the suitability of the mitigation measures and recommendations; ➢ Identify any short comings and mitigation measures to address the short comings; ➢ Evaluate the appropriateness of the reference literature; ➢ Indicate whether a site-inspection was carried out as part of the peer review; and ➢ Indicate whether the article is well-written and easy to understand. x. The specialist input referred to in comment (viii) of the comments on the draft scoping report signed 19 October 2017; must additionally address the following: ➢ indicate whether the recommendation by the EAP that detailed studies are not required is acceptable; ➢ Indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable; ➢ Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated; ➢ Evaluate the appropriateness of the reference literature used; ➢ Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input;	xix. Kindly refer to a latter from the Manager: Project Management Unit at Kai !Garib Municipality in Appendix O, for the confirmation of service availability. xx. Please see the Needs and Desirability table in Chapter 1 of this report which also details regional and locational motivation. xxi. Please see Chapter 2 (and the EMPr) for the final site layout map which has been informed by all environmental sensitivities. xxii. Please see Chapter 3 (and the EMPr) for a map inclusive of all environmental sensitivities on site. xxiii. Please see Chapter 3 (and the EMPr) for a map with the final site layout superimposed on the environmental sensitivities map. xxiv. A shapefile of the preferred development layout/footprint has been submitted to this Department in electronic format in conjunction with the submission of this Draft EIAR. The Environmental Management Programme (EMPr) requirements (i) to (xvi) have been included in the EMPr attached as Part B to this Draft EIAR. The EMPr is inclusive of the Final Site layout map as well as the layout overlain on the environmental sensitivities map. With regards to the comment on timeframes as per Regulation 45, please note that an extension motivation for submission of the Final EIAR to the Department was submitted on 19th January 2018. This request was

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	➢ Indicate if the studies being referred to covers the preferred site; and ➢ Provide an indication on the cumulative impacts of these studies in relation to the proposed development. ➢ Must be conducted or input provided on by a suitably qualified specialist in the field. xi. Due to the number of similar applications in the area, all the specialist assessments must include a cumulative environmental impact assessment for all identified and assessed impacts. The cumulative impact assessment must indicate the following: ➢ Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, is hectares of cumulatively transformed land. ➢ Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. ➢ The cumulative impacts significance rating must also inform the need and desirability of the proposed development. ➢ A cumulative impact environmental statement on whether the proposed development must proceed. xii. The cumulative impacts on SKA must also be assessed for and considered in the EIAr. xiii. All communications and correspondences between the EAP and SKA-SA must be included in the EIAr. xiv. The impacts on the proposed battery storage facility must be adequately assessed. Furthermore, it is noted that the activity applied for the battery storage has a threshold of between 80m3 to 500m3, whereas the proposed battery storage facility will have a capacity of 1120m3. As such, the correct listed activity must be applied for and	refused on 12/02/2018 by the Department. Thus, this application will follow the prescribed timeframes in Regulation 23(1). It must be noted that the three seasons of bird monitoring have been included in this DEIAR which is in line with the Regime 2 (Best practice guidelines, Jenkins et al., 2017). Note this excerpt from the Avifaunal Specialist Study (Appendix J): ***"NOTE:*** *For the purposes of this study we conducted* ***2 specialist site visits and 3 seasons*** *of on-site bird monitoring, in accordance with the best practice guidelines (Jenkins et al, 2017). The proposed project falls under* ***Regime 2*** *on account of being of 'medium' avifaunal sensitivity and greater than 150ha in extent. This means it requires 2 to 3 site visits of 3 to 5 days duration each over 6 months. We conducted 3 x 4 day site visits thereby slightly exceeding the minimum requirements in our view."* Thus, there is **no incomplete information in this report** in terms of Avifaunal impacts or information being withheld from the public in this regard. Please note that Appendices A to C in the Acceptance of Scoping Letter (which were referred to throughout the letter) have been adhered to in the relevant sections as per the responses **below.**

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	all the impacts related to the battery storage facility, including specialist studies if any must be conducted and assessed. xv. The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for solar energy facilities below. xvi. The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities. xvii. The EIAr must provide the following: - Clear indication of the envisioned area for the proposed solar energy facility; i.e. placing of photovoltaic panels and all associated infrastructure should be mapped at an appropriate scale. - Clear description of all associated infrastructure. This description must include, but is not limited to the following: ➢ Power lines; ➢ Internal roads infrastructure; and; ➢ All supporting onsite infrastructure such as laydown area, guard house and control room etc. ➢ All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation. xviii. The EIAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations. xix. Information on services required on the site, eg. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided. xx. The EIAr must provide a detailed description of the need and desirability, not only providing motivation on the need for clean energy in South Africa of the proposed activity. The need and	

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites. xxi. A copy of the final site layout map and alternatives. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following: • PV positions and its associated infrastructure; • Permanent laydown area footprint; • Internal roads indicating width (construction period width and Operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); • Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; • The location of sensitive environmental features on site eg. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; • Substation(s) and/or transformer(s) sites including their entire footprint; • Connection routes (including pylon positions) to the distribution/transmission network; • All existing infrastructure on the site, especially roads; • Buffer areas; • Buildings, including accommodation; and • All “no-go” areas. xxii. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process. xxiii. A map combining the final layout map superimposed (overlain) on the	

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	environmental sensitivity map. xxiv. A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to: **Postal Address:** Department of Environ mental Affairs Private Bag X447 Pretoria, 0001 **Physical address:** Environment House 473 Steve Biko Road Pretoria For Attention: Muhammad Essop Integrated Environmental Authorisations Strategic Infrastructure Developments Telephone Number: (012) 399 9406 Email Address: MEssop@environ ment.gov.za The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:	

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted. ii. The final site layout map. iii. Measures as dictated by the final site layout map and micro-siting. iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process. v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken. vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase. viii. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats. ix. An open space management plan to be implemented during the construction and operation of the facility. x. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late	

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	afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations. xi. A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment. xii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must 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 must promote the dissipation of storm water run-off. xiii. A fire management plan to be implemented during the construction and operation of the facility. xiv. An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion. xv. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. xvi. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants. The EAP must provide detailed motivation if any of the above	

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	requirements is not required by the proposed development and not included in the EMPr. The EAP must provide the final detailed Site Layout Plan as well as the final EMPr for approval with the final ElAr as this Department needs to make a decision on the EA, EMPr and Layout Plan. Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description. <u>You are hereby reminded that should the ElAr fail to comply with the requirements of this acceptance letter, as well as the requirements of the ElA Regulations, 2017, the project will be **refused** in accordance with Regulation 24(1)(b) of the EIA Regulations, 2014.</u> The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in Regulation 43(1). Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described	

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT	RESPONSE FROM EAP/APPLICANT/SPECIALIST
	in Chapter II, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr. You are requested to submit two (2) electronic copies (DVD and USB) and one (1) hard copies of the EIAr to the Department. Please also find attached information that must be used in the preparation of the EIAr. This will enable the Department to speedily review the EIAr and make a decision on the application. You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, which stipulates that no activity may commence prior to an Environmental Authorisation being granted by the Department. **<u>Annexure 1</u>**	
	Format for the comments and responses trail.	The format has been adhered to (i.e. this table).
	A1. General Site information	A1. This can be seen in Chapter 1, Table 1.1 and Chapter 2. Copies of deeds can be found on Appendix O.
	A2. Sample of technical details for the proposed facility	A2. This table is reflected in Chapter 2, Table 2.2.
	A3. Site maps and GIS information	A3. A map package is being submitted to the Competent Authority together with the submission of this DEIAR in electronic format (CD) as per request xxiv. All the listed map details have been included in the shapefiles and the maps (if applicable). Certain aspects (i.e. slope analysis,

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		Appendix M) has been addressed in the relevant specialist studies in Appendices I to N.
	A4. Regional map and GIS information	A4. Please see Chapter 2 and 3 for regional locality maps inclusive of these requested aspects. In addition, the site layout maps and environmental sensitivity maps are also found in these chapters. The map package mentioned above that is being submitted with this DEIAR is also inclusive of this information in the form of shapefiles and PDF maps.
	A5. Important Stakeholders	A5. Please see Appendix C (I&AP database) for inclusion of these two listed stakeholders. In terms of comment from John Geeringh (Eskom), please see Appendix G for comment from him as requested.
	B. Agriculture Study requirements	B. Please note that some of the aforementioned requirements in this annexure relate to a full Soils and Agricultural Specialist Study, which was not conducted for this project (as noted by the CA in comment x. above). A soils and Agricultural Impact Statement was conducted (Appendix N1) by the EAP and externally reviewed. Due to the impacts found in this statement being **low to very low**, a full study was not deemed necessary by the peer reviewer, and hence some of these requirements listed in (B) fall outside the scope of the statement. However, the majority of these requirements have been discussed in the statement (as applicable), and further researched in the reference studies used.

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	C. Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007)	C. Please see the following sections where this request is addressed: • Comments from SALT in Appendix O • Comments from SKA in Appendix O • Full RFI study in Appendix P

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX I:

Ecological Report

ECOLOGICAL IMPACT ASSESSMENT:

Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility Skeerhok PV 2, near Kenhardt, Northern Cape Province

Report prepared for:

CSIR – Environmental Management Services

P O Box 320

Stellenbosch, 7599

South Africa

Report prepared by:

Simon C Bundy – SDP Ecological

P.O. Box 1016

Ballito 4420

South Africa

January 2018

SPECIALIST EXPERTISE

NAME Simon Colin Bundy
PROFESSION Ecologist
DATE OF BIRTH 7 September 1966
PLACE OF BIRTH Glasgow, Scotland
NATIONALITY South African / British
MEMBERSHIP OF PROFESSIONAL BODIES: South African Council of Natural Scientific Professionals No. 400093/06 – Professional Ecologist

KEY QUALIFICATIONS

Simon Bundy has been involved in environmental and development projects and programmes since 1991 at provincial, national and international level, with employment in the municipal, NGO and private sectors, providing a broad overview and understanding of the function of these sectors. Bundy has a core competency in coastal management and botanical issues and has worked on coastal projects in the Seychelles and Tanzania providing ecological and general environmental advice and support. Bundy has been involved in a number of renewable energy projects including the Kalkbult, Dreunberg and Lindes Solar Parks in the Northern and Eastern Cape, as well as wind energy and solar projects in the Western Cape and Rwanda. In such projects Bundy has provided both technical ecological support, as well as the undertaking of environmental impact assessments.

Allied to the above, Bundy has provided technical assistance to the “Save the Wild Coast” initiative through a technical report outlining the concerns relating to dune mining in and around the Xolobeni prospecting region while also evaluating critically, a number of environmental impact assessments and technical reports for various clients. Such evaluations have included “sea defence structures at Buffalo Bay, Western Cape”, through the Nelson Mandela University. Bundy has also assisted iSimangaliso Wetland Park in its initiatives against unlawful developments in the Bangha Nek area. Bundy has also acted as expert witness on ecological issues on a number of legal cases.

From a technical specialist perspective, Bundy is competent in a large number of ecological methodologies and analytical methods including statistical methods ; multivariate analysis and ordination. Bundy is competent in wetland delineation and has formulated ecological coastal set back methodologies for EKZN Wildlife and the Oceanographic Research Institute. Bundy acts as botanical specialist for Eskom Eastern Region, with specific interest in coastal habitat forms.

EDUCATION

- 1990 - BSc Biological Science – University of Natal
- 2004: MSc - University of KwaZulu-Natal,
- 1997: Diploma Project Management, Executive Education
- PhD candidate, Department of Engineering, UKZN
- 1998: “Sustainable development initiatives” in Europe. Training Programme in Berlin, Germany
- 2000 : Training course : “Environmental Economics and Development”. University of Colorado (Boulder) USA.

SELECTED RELEVANT PROJECT EXPERIENCE

Task Team Chair and Project Ecologist: Task Team for Coastal Disaster Management, KwaDukuza 2007 - 2011

Management of coastal clean up programme immediately following March storm event of 2007. Activities included introduction of geofabric bag protection options, coastal retreat implementation and development of policy on coastal management following destruction of coastline.

Ecological Review of Lake Mzingazi for Umhlatuze Water: University of KwaZulu Natal – (2010)
Review of habitat structure and integrity of Mzingazi Lake System at Richards Bay required to interpret transformation of aquatic system over time and evaluate forecast for future reference.

Ecological Review and Agricultural Assessment – Dreunberg Solar Park, Eastern Cape : Scatec Solar – (2012)
Ecological review of proposed solar park near Burgersdorp, with additional evaluation of veld carrying capacity.

Ecological Review and Rehabilitation Planning : Sodwana Bay :iSimanagaliso Wetland Park Authority – (2013 - 2014)
Analysis and review of state of dune cordon in and around Sodwana Bay with consideration of the impacts of removing exotic trees from site to rejuvenate dune and beach dynamics

Ecological Review of Kalkbult Solar Park (2009)
Ecological review and delineation of ecologically significant areas within the proposed Kalkbult Solar Park, near Potsfontein, Northern Cape.

Ecological and Dune retreat investigation of the Kosi Bay Illegal Development Isimangaliso Wetland Park Authority (2011)
Specialist investigation into the impact upon the dune cordon of structures placed in and close to dune cordon near Kosi Bay mouth.

PUBLICATIONS

Bundy, S. C. and Forbes, N. T., 2015. *"Coastal dune mobility and their use in establishing a set back line*" 9th West Indian Ocean Marine Science Conference 2015
Bundy, S. C. and Smith, A. M. 2009 *"Analysis of the Recovery of Two Separate Coastal Dune Systems Following the 2006 – 2007 Marine Erosion Event and Assessment of the Artificial Dune System in Coastal Management*" KZN Marine and Coastal Management Symposium, Durban South Africa.
Bundy, S. C., Smith, A. M., Mather, A. A. 2010. "Dune retreat and stability on the Northern Amanzimtoti Dune Cordon", EKZN Wildlife Conservation Symposium 2010
Smith, A Mather AM Bundy SC, Cooper AS Guastella L, Ramsay PJ and Theron A; 2010 "*Contrasting styles of swell-driven coastal erosion: examples from KwaZulu-Natal, South Africa*" Geology Journal", Cambridge University Press
Smith, AM, L Guastella , SC Bundy and AA Mather 2007 "*Coastal Storm Damage in the March 2007 Storm* SA Journal of Science 2007 "A Synopsis of Recent Storm Events"
Guastella L, Smith A Mather A and Bundy S 2008 "*As Memories Fade - A Review of the Post 2007 Coastal Erosion Events"* African Wildlife 32 / 2008
Smith A, Mather A, Theron A, Bundy S and Guastella L 2008 **"***The 2006-2007 KwaZulu – Natal Coastal Erosion Event in Perspective*" 2009 Contribution to the The South African Environmental Observation Network publication " Climate Change in Southern Africa"
Smith A and Bundy S 2009 "*Coastal erosion: reparative work on the Ballito coastline, KwaZulu-Natal, South Africa, was it enough?*" 2009 International Multi Purpose Reef and Coastal Conference, Jeffrey's Bay South Africa.
Smith AM, SC Bundy 2012 "Review of Coastal Defence Systems in Southern Africa" Article for Springer Scientific Publications through Ulster University, Pilkey and Cooper

Bundy SC AM Smith, L Guastella 2012 "*A Review of Select Dune Rehabilitation Initiatives and a Proposed Methodology towards Ensuring a Prudent Approach towards the "Greening of Dunes*" VI International Sandy Beaches Symposium Emphakweni Port Alfred
Various popular articles including documentaries on coastal and climate change issues

SPECIALIST DECLARATION

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

ECOLOGICAL & HYDROLOGICAL IMPACT ASSESSMENT: Scoping and Environmental Impact Assessment for the proposed development of three 100 MW Solar Photovoltaic Facilities (Skeerhok PV 1, PV 2, & PV 3) near Kenhardt in the Northern Cape Province

Specialist:	SDP Ecological and Environmental Services		
Contact person:	Simon C Bundy		
Postal address:	P O Box 1016, Ballito		
Postal code:	4420	Cell:	082 446 4847
Telephone:	032-9460685	Fax	032-9460784
E-mail:	simon@ecocoast.co.za		
Professional affiliation(s) (if any)	SACNASP 400093/06		

Project Consultant:	Council for Scientific and Industrial Research		
Contact person:	Kelly Stroebel		
Postal address:	PO Box 320, Stellenbosch		
Postal code:	7599	Cell:	082 660 1907
Telephone:	021 888 2432	Fax:	021 888 4693
E-mail:	Kstroebel@csir.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, SIMON C BUNDY declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

SDP Ecological

Name of company (if applicable):

26/ 01 / 2018

Date:

EXECUTIVE SUMMARY

An Ecological Impact Assessment which included consideration of the habitat and faunal components of a portion of land on the Farm Smutshoek was undertaken during the period June to November 2017. The site in question, Skeerhok PV 2, is part of a broader complex of land that has been earmarked for the establishment of photovoltaic power generation facilities. The assessment included desktop evaluations, as well as on site evaluations of the study area.

The investigations looked specifically at habitat form and structure and the relationship of such form and structure to the surrounding geology and geomorphology. The assessment sought to identify the ecological status of the site and identify key biophysical drivers within the site. Such information was then considered in respect of the proposed development, from which changes for the baseline could be anticipated or forecast and direct, indirect and cumulative levels of impact could be evaluated.

The site is considered to fall within a xeric environment (dry or semi desert) and as such is subject to significant seasonal to daily fluctuations in meteorological and physical factors which influence the prevailing ecology. In addition to the above, anthropogenic interventions associated with both the presence of livestock on the land in question, as well as indirect influences arising from the establishment of infrastructure (roads and rail) have served to alter other bio physical factors, including surface hydrology and the nature and composition of habitat.

The site lies within the upper catchment of the Rugsrivier, a seasonal tributary to the Hartbeesrivier, which lies to the south of the site. The site has a number of shallow dendritic drainage features, however only one, a feature to the south is considered to warrant any form of exclusion from the area in question is to be considered devoid of any significant drainage features with only weakly defined dendritic drainage features being evident to the far north of the site. These eco-morphological features are to be considered as being of little significance in the prevailing surface hydrological regime.

Consequently, there are no significant areas within Skeerhok PV 2 that should be subject to exclusion from an ecological perspective. A minor exclusion buffer around a southern drainage feature is however recommended. Mitigation measures that may address or redress identified potential impacts on the broader terrestrial landscape, as well as hydrogeomorphological features adjacent to the site, were identified during the course of the assessment and proposed in the Environmental Management Programme.

Having given due consideration to the site and its present ecological state, as well as the nature of the proposed development, it is our opinion that the development cannot be precluded from the site on ecological grounds, provided that suitable measures, as espoused in this report are implemented.

LIST OF ABBREVIATIONS

amsl	above mean sea level
CSIR	Council for Scientific and Industrial Research
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
ELP	Electrical light pollution
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
SANBI	South African National Biodiversity Institute
TWINSPAN	Two Way Species Indicator Analysis

GLOSSARY

Definitions	
Arid	Areas which receive low levels of rainfall or there is a moisture deficit.
Crepuscular	Fauna that is active at twilight
Dendrogram	A diagram showing relationships determined through a cluster analysis
Calcrete	A carbonate horizon formed in semi-arid regions. Also known as a caliche.
Dolerite	Form of igneous rock.
Drainage line	A geomorphological feature in which water may flow during periods of rainfall.
Edaphic	Pertaining to soils.
Fossorial	Pertaining to burrowing animals or those which live underground
Geophyte	Plants with underground storage organs.
Graminoid	Grasses or grass-like. Also monocotyledonous plants.
Gully	An erosion line exceeding 30cm in depth where water flow is concentrated and erosion resulting from flow is clearly evident.
Hydrogeomorphological	The interaction of geomorphic processes, landforms and /or weathered materials with surface and sub-surface waters.
Hygrophilous	Plants growing in damp or wet conditions
Multivariate analysis	A statistical method of evaluating non linear relationships between groups of data.
Rill	Shallow erosion lines less than 30cm deep
Xeric	A dry, as opposed to wet (hydric) or mesic (intermediate) environment.

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS (AS AMENDED)

Requirements of Appendix 6 – GN R326	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Pgs 1 - 4
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Pg 4
c) an indication of the scope of, and the purpose for which, the report was prepared;	S 1.1.2
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	S1.1.4
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	S1
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	S1.3.3
g) an identification of any areas to be avoided, including buffers;	S 1.3.3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	S 1.3.3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	S 1.1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	S1.5.1
k) any mitigation measures for inclusion in the EMPr;	S 1.5.1.1 + S1.6 + S1.8
l) any conditions for inclusion in the environmental authorisation;	S 1.8 + S1.9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	S1.6
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	S1.9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	S 5.1
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Appendix H: Comments and Responses Chapter of the EIA Report
q) any other information requested by the competent authority.	N/A

TABLE OF CONTENTS

TABLES AND FIGURES

ECOLOGICAL IMPACT ASSESSMENT

This chapter presents the findings of the Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna) that was prepared by Simon Bundy (of SDP Ecological and Environmental Services (SDP)) as part of the EIA for the proposed Skeerhok PV2 project, located near Kenhardt, within the Northern Cape Province.

1.1. INTRODUCTION AND METHODOLOGY

1.1.1. Scope and Objectives

As noted in Chapter 1 of the EIA Report, the establishment of a PV facility exceeding thresholds stipulated within the EIA Regulations requires an Application for Environmental Authorisation to be submitted to the relevant, mandated authority (i.e. the National DEA), as well as the undertaking of an EIA Process. This Ecological Impact Assessment specialist study is being undertaken as part of the EIA Process in order to evaluate and inform on the bio-physical and ecological aspects of the receiving environment in relation to the proposed Skeerhok PV 2 facility. Skeerhok PV 2 is one of three sites that lie within an existing land parcel (Figure 1) that have been identified for the possible establishment of photovoltaic facilities. PV 2 lies on the Farm Smutshoek 395.

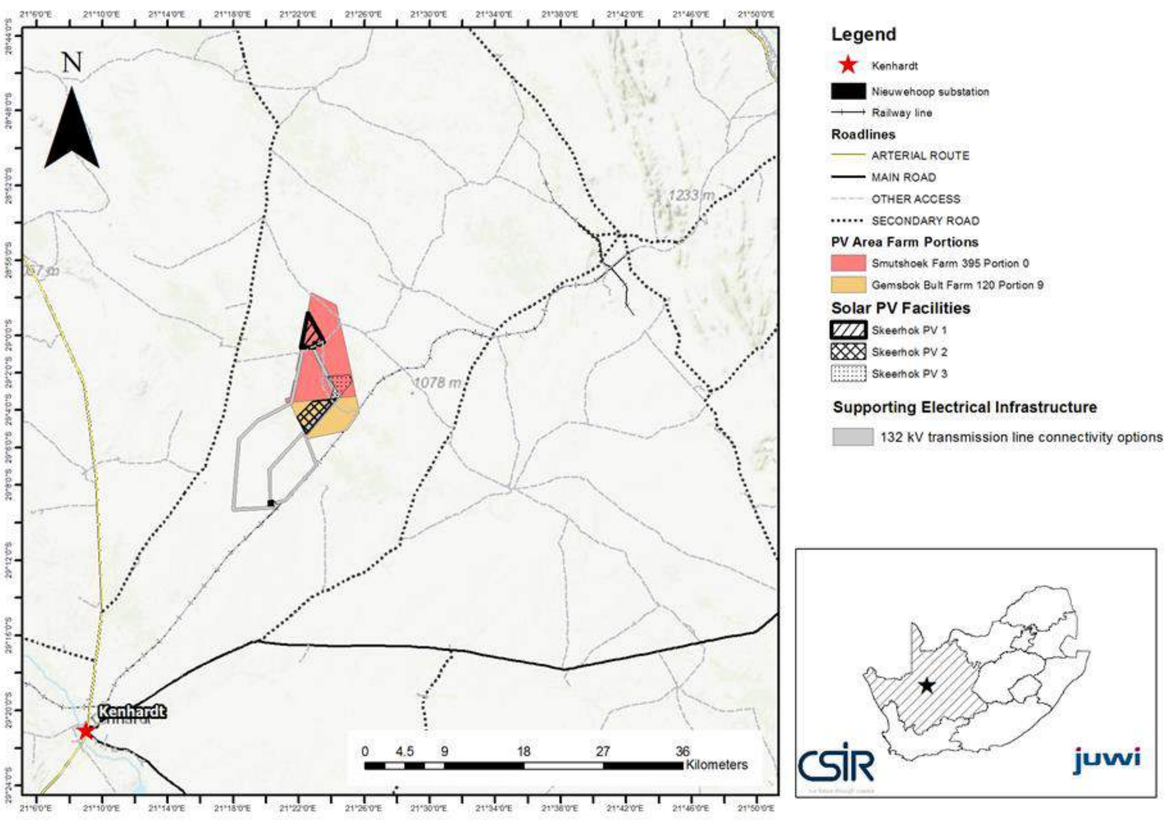

Figure 1. Map depicting the position of the Skeerhok photo voltaic facilities within the larger land complex and further indicating areas that are excluded from the development of PV facilities.

This biophysical evaluation of the land upon which PV 2 is proposed to be established was undertaken during the period June to September 2017 and entailed both a literature review of the region, as well as on site evaluations, during which specific primary data was collected and evaluated. In addition, the identification of key ecological features on and adjacent to the site was undertaken allowing for the interpretation of the prevailing habitat form and associated processes.

All data collected in the field and during the literature review was evaluated and interpreted in order to provide an understanding of the nature of the prevailing environment at a landscape and habitat level. In addition specific evaluation of data relating to habitat form and structure was undertaken, aiding in the identification of bio-physical anomalies within the prevailing environment. Such variance may be considered to be indicative of differing habitat forms, which under consideration, may be of higher order ecological value in relation of the prevailing environment.

1.1.2. <u>Terms of Reference</u>

The overall objectives of the Ecological Impact Assessment are to:

- Identify and establish an understanding of the site under consideration at a landscape scale of evaluation with particular consideration being given to aquatic or important terrestrial habitats, as they may be identified.
- Provide an evaluation and status of habitat composition and significance within the site in order to evaluate the potential impact of the proposed development on the ecological function of the site.
- Assess the actual and potential impacts arising from the proposed development on both the habitat and fauna within the study site. Such impacts may be directly applicable to the site and contained within the site boundaries, or may be indirect impacts, which may have ramifications outside of the site boundary; or may be of a cumulative nature in terms of impacts arising from similar developments or activities within the region.
- Provide guidance on the implementation of mitigation measures that serve to moderate any negative impacts that may arise on site as a consequence of the development.

The Scope of Work is based on the following broad terms of reference, which have been specified for this specialist study:

- Review detailed information relating to the project description and precisely define the environmental risks to the terrestrial and aquatic environment (including avifauna) and consequences for ecology.
- Compile a baseline description of the terrestrial and aquatic ecology (including avifauna) of the study area, and provide an overview of the entire study area in terms of ecological significance and sensitivity (i.e. in terms of the major habitat forms within the study area, giving due consideration to terrestrial ecology (flora), terrestrial ecology (fauna) and freshwater ecosystems/wetlands).
- Provide specific ecological data in respect of the floral, faunal and aquatic components of the site using ground-truthing methods, with an emphasis on those areas considered to be of “high” and possibly, “moderate” sensitivity (based on the desktop study).
- Based on the desktop study, undertake field work and sampling across the site to record relevant data and to compile an overview of the habitat under review.
- Collate all data collected during the field work and undertake a statistical review using methodologies that allow for the comparison of biological data.
- Consider wetlands (endoreic pans) and associated water resources within the site in terms of significance within the catchment, habitat value and significance and delineation of extent through preliminary on site evaluation and the use of aerial imagery interpretation (where these arise). Determine if a Water Use License is required.
- Undertake a faunal investigation on site, based on the points identified during the preliminary aerial photographic interpretation.
- Provide a detailed terrestrial and aquatic ecological sensitivity map of the site, including mapping of disturbance and transformation on site.
- Identify and categorize the potential direct, indirect and cumulative impacts (in line with the impact assessment methodology provided in Chapter 4 of the EIA Report) on the terrestrial and aquatic ecology, communities and ecological processes within the site during the construction, operation and decommissioning phases of the project.

- Provide input to the EMPr, including mitigation and monitoring requirements to ensure that the impacts on the terrestrial and aquatic ecology are limited.
- Compile an assessment report qualifying the risks and potential impacts of the development on terrestrial and aquatic ecology in the study area and impact evaluations.

1.1.3. Approach and Methodology

A literature review and desktop analysis was undertaken prior to the field investigation, utilizing various sources including the South African National Biodiversity Institute (SANBI) data and other relevant sources. Recent and historical aerial imagery of the site was reviewed in order to identify points for investigation during the field survey.

Utilising the above information, a field investigation was undertaken during the early summer of 2017 (September), whereby:

- Sites of geomorphological or topographic variance were identified and subjected to an evaluation of species present within a 40 m transect established across the selected site. Species were identified and collated according to a “presence – absence” method of evaluation (Figure 2). A total of 9 transects were established across the entire site.

- Additional random sample points were selected from other sites for comparative purposes.

- Any additional species of significance (e.g. *Aloe dichotoma*), not identified within the sample sites were also noted.

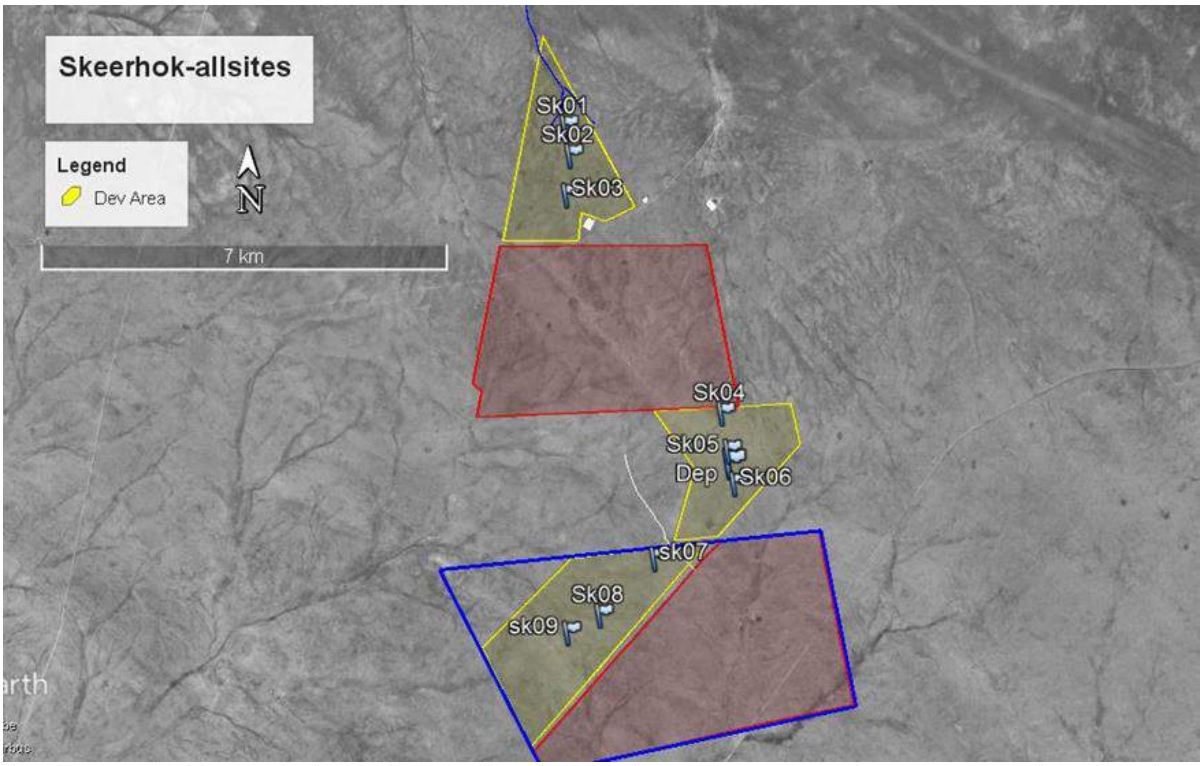

Figure 2. Aerial image depicting the sample points used to evaluate vegetation structure and composition across the three proposed photo voltaic sites that comprise the Skeerhok PV facilities. Source: Google Earth, 2015).

All data was collated and subject to evaluation using multi-variate statistical methods in order to:

1. Place the data into a hierarchy of similarities according to species composition and sample sites.

2. Give consideration to the overall structure of habitat within the subject site.

3. Identify any habitat anomalies that may be identified in such analysis.

4. Allow for the interpretation of such data in order to prioritise and evaluate habitat form and structure within the study area

In addition, using methods identified in the Department of Water Affairs' "A Practical Field Procedure for Identification of Wetlands and Riparian Areas" (2005), wetland and riparian areas were identified. Such evaluations utilised both geomorphological, geohydromorphic edaphic conditions and botanical indicators in order to identify such components. In practise, only geomorphological components were utilised, as discussed below. Where riparian and wetland systems are identified and lie within 500 m of the proposed development/activity, an application in terms of Section 21 c and i, of the National Water Act (1998) is required to be submitted to the mandated authority.

It is important to note that no alternative site for the Skeerhok PV 2 project was proposed by the proponent; therefore no comparative exercise has been undertaken between sites. However, the applicant is pursuing two additional individual sites to the Skeerhok PV 2 facility.

Further consideration of the cumulative impacts associated with the development of Skeerhok at a broader landscape level of evaluation was undertaken. Such cumulative impact assessment was based upon the general understanding of "cumulative impacts" where such impacts "result when the effects of an action are added to or interact with other effects, in a particular place and within a particular time" (USEPA 1999). Evidently, this report will only consider the bio-physical components of the site in the landscape context over an arbitrary extent covering 20 kilometers from the site, as outlined within the approved Scope of Work included in the Final Scoping Report, dated November 2017. The assessment of the cumulative ecological and hydrological impacts was undertaken, based upon the following:

- A comparison of similar developments to the Skeerhok PV project land use within 20 kilometres of the Skeerhok site. The identification of sites was based upon information provided by the CSIR based on a dataset provided by the DEA and in-house data.
- Comparison was made across all identified sites in order to identify the habitat forms affected by the establishment of the PV facilities
- Comparison was made in terms of the "transformation" of Bushmanland Arid Grassland, which is the habitat form subject to transformation within the Skeerhok PV facilities
- The cumulative and comparative loss of Bushmanland Arid Grassland was subject to interrogation in order to identify the contribution of the Skeerhok PV facilities to the over-all loss of such habitat.

1.1.4. Assumptions and Limitations

The site assessment and collation of data was undertaken during the period 4 – 7 September 2017, at a period of seasonal change. Weather records for the region indicate that there had been a significantly improved rainfall during the summer period from January to March 2017 although summer rainfall is showing a distinct downward trend (www.worldweatheronline.com). Since a peak of 25mm in April 2017, there had however been a significant decrease in rainfall with only 1mm being recorded between July 2017 and the time of the site reconnaissance. Such meteorological stressors mean that some botanical species, in particular geophytes, are not generally evident. This may affect both the analytical and observation results of the investigation.

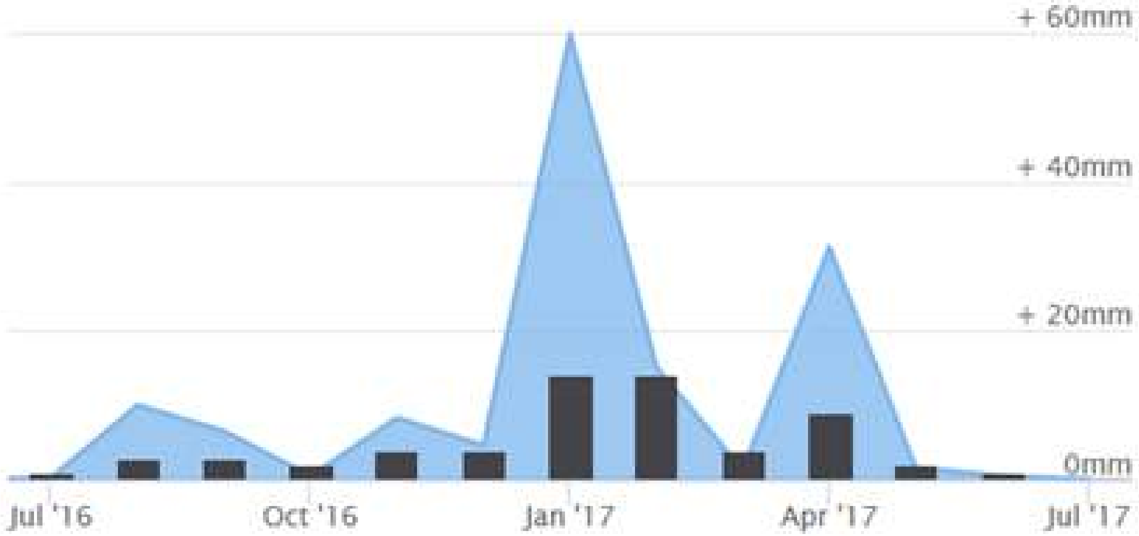

Figure 3. Rainfall records for Kenhardt July 2016 to July 2017 Rain days), Rainfall)
Source : www.worldweatheronline.com**.**

Allied to the above, the site investigation coincided with the regular, early summer dry period. As higher rainfall in the region is a late summer phenomenon, many botanical species remain dormant, until the advent of rains, effectively masking their presence.

In addition, the assessment was undertaken using a random sampling method. As such, minor outliers within the site may not have been evaluated. The random sampling method, if correlated to topography and other aspects, is however a robust method of evaluating habitat across a large area. Upon the finalisation of the detailed design of the proposed project, an evaluation of the final footprint should be undertaken subsequent to the issuing of an Environmental Authorisation, (should one be granted for the proposed project) and upon completion of the detailed engineering prior to the commencement of construction).

In terms of the assessment of potential cumulative impacts included in this specialist study, these take into consideration certain developments that occur with a 20 km radius of the proposed project, as shown in Chapter 4 of the EIA Report.

1.1.5. Source of Information

This assessment was undertaken utilising:

- 1:50 000 topographic mapping sourced from the Surveyor General's office; and
- Aerial imagery sourced from Google Earth.
- Aerial imagery sourced from ESRI

In addition, use was made of the following data:

- Wetland and riparian habitat GIS data sourced from the National Freshwater Ecological Priority Area Programme of SANBI;
- SANBI veld types data; and
  Literature as referenced.

1.2. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO TERRESTRIAL AND AQUATIC ECOLOGY (INCLUDING AVIFAUNA AND HYDROLOGICAL FEATURES)

The proposed project will require the following key actions that are relevant to ecological aspects of the site:

1. Cordoning and fencing of the site during both the construction and operational phases. This component of the project usually entails the establishment of an electrified fence which remains *in situ* for the lifetime of the project (i.e. for the operational phase). For the construction phase, the construction area and construction site camp may also be cordoned off with temporary fencing.

2. Clearance or partial clearance of topographic features and significant vegetation where applicable during the construction phase.

3. Establishment of roadways (i.e. internal gravel access roads) and hardpanning of surfaces, with minor stormwater management aspects being introduced during the construction and operational phases.

4. Establishment of module arrays with concomitant cabling and provision of invertors within arrays. The footing of the module framework is founded into the ground using an earthscrew or similar method. Cables are placed in trenches to a depth of approximately 1.0 m.

5. Establishment of step up transformer and the on-site substation. This facility is expected to occupy an area of approximately 2 ha. It is fenced and isolated from the balance of the site.

6. Establishment of offices and related infrastructure.

7. A yard for storage and general operations will be set aside, adjacent to the built offices.

The establishment of site will thus entail *low to significant* alteration of the prevailing habitat, depending upon the final design and layout of the PV facility. A general sequestering of the subject area, through the fencing of the site from the surrounding habitat forms, thus arises.

A detailed project description is included in Chapter 2 of the Draft EIA Report, which includes dimensions and specifications of the proposed project components.

It is important to note that the information regarding the proposed 132 kV transmission lines connecting Skeerhok PV1 to the Nieuwehoop substation is indicatively provided in this report though is fully assessed in a separate Basic Assessment process..

1.3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

According to Mucina and Rutherford's veld type classification of 2006, Kenhardt and surrounding regions fall within the Bushmanland Arid Grassland veld type (NKb3). This veld type is located ostensibly south of the Orange River, but may include a number of smaller habitat forms within its broader extent.

The Skeerhok 2 study site lies to the south of a low elevated ridge which serves to divide the watershed between the more northerly proposed Skeerhok PV1 facility and the two proposed southerly projects, namely Skeerhok PV2 and Skeerhok PV3. Skeerhok PV 2, like the neighbouring PV3 site, lies upon a level and topographically consistent portion of land, with its highest elevation lying to the north of the site. The study site incorporates an area of approximately 5.7km^2.

Surface drainage from the Skeerhok PV 2 site is generally dispersive in the form of sheet flow with only minor seasonal dendritic drainage features ("waadhis") being evident in the extreme south of the site. Drainage is in a southerly direction with the primary drainage system being the Rugseersrivier, a seasonal system that discharges into the Haartbees River, near the town of Kenhardt. The catchment of the Rugseerrivier is dissected by a number of roadways and in particular, the main Sishen- Saldanha railway line which effectively bisects the north eastern portion of the catchment (including Skeerhok PV 3) from the southern extent of the catchment and the Rugseerrivier itself. Notably, such infrastructure indicates that the local hydrology of the region has been significantly altered.

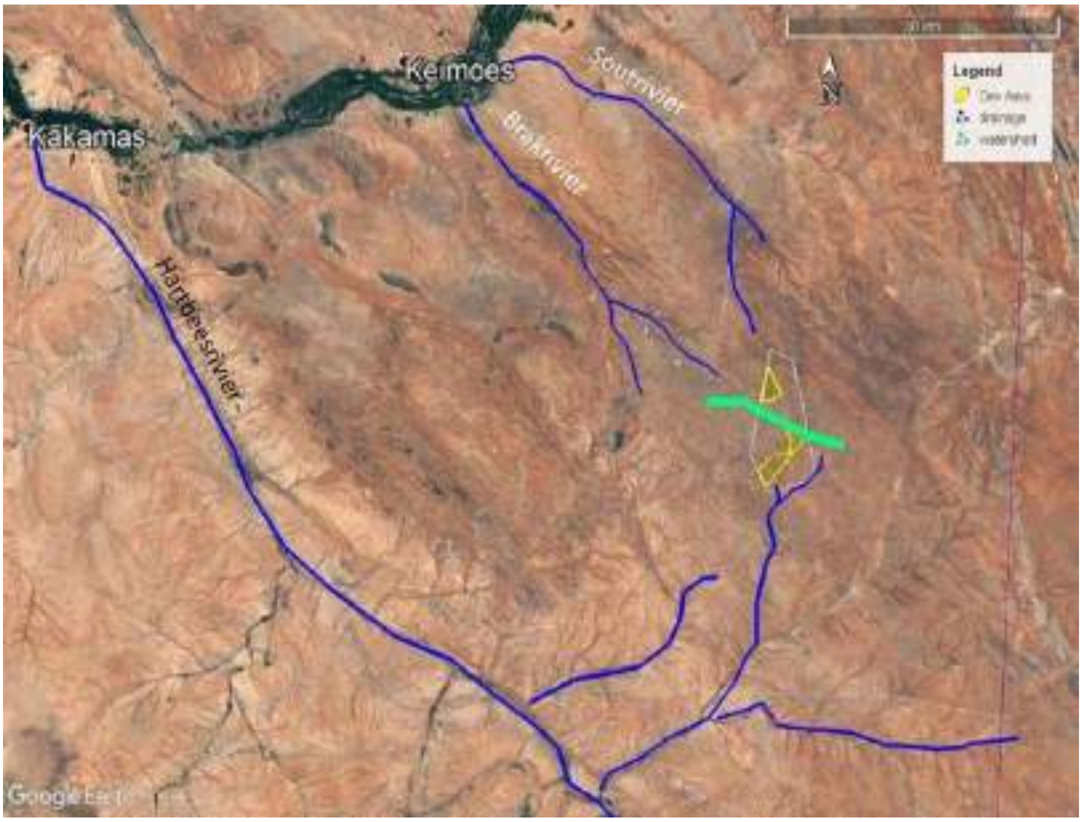

Figure 4. Map indicating drainage lines associated with the Skeerhok PV projects and also indicating the watershed dividing the two catchments over which the Skeerhok PV Projects traverse. (Source Google Earth, 2015)

The area in general can be considered to have a low rainfall of less than 200 mm per annum (SA Weather Services, *www.**weathersa**.co.za*) although the recorded average rainfall for the period 2000 to 2012 approximates 238 mm within an average of 51 rain days per year (www.worldweatheronline.com). As such the area has been described as a "semi-arid region" (Bailey, 1979). Using the Koppen-Geiger climate classification method (www.koeppen-geiger.vu-wien.ac.at), the area is classified "BWh", which is indicative of an *arid hot environment*, this classification is supported by Esler *et. al.,* (2006) who have defined areas with an annual rainfall of less than 200 mm as being "deserts". This *desert* status may be the case in the Kenhardt region under its lower rainfall periods. In addition, the highest, annual temperatures for the region are recorded between January and February, with maximum temperatures being 37˚C (www.worldweatheronline.com). Extreme temperatures thus coincide with the peak rainfall period. Such correlation may give rise to the low groundwater recharge rates projected for the region, this being estimated at approximately 0.03 mm / annum. (Musekiwa and Majola, 2011).

With the above in mind, the most definitive physical drivers of the Bushmanland Arid Grassland veld type that lies within the study area, are meteorological and will relate to surface and subsurface hydrology. Other physical drivers will include localised geologies and edaphics.

Terrestrial and hydrological components of the site are discussed separately below, however given the nature of the environment, a reductionist approach to the local ecology is difficult to justify and it follows that a more holistic approach to the ecology of the site should be pursued in its evaluation

1.3.1 Terrestrial Habitat and Vegetation

The proposed Skeerhok PV 2 site is a generally level extent of land. The site can be described as “flat”, generally featureless terrain, with few elevated features. Like the adjoining sites within the Skeerhok PV complex, the site is dominated by the Bushmanland Arid Grassland veld type. The local geology comprises primarily of a mix of sandy soils overlying predominantly dolerite and calcrete geologies with occasional quartzite outcrops (Figure 5)

Figure 5. Image indicating the nature of the site proposed for the establishment of Skeerhok PV 2. Note the graminoid dominance and occasional exposure of dolerite, suggesting shallow soils.

No geomorphologically distinct drainage features are evident across the study site, however one minor dendritic drainage feature is evident in the extreme south of the site. (Figure 6). This feature can be described as a shallow, geologically driven channel that may in turn be further excavated by the movement of livestock. The feature shows very little evidence of regular flow and can generally be identified through the more verdant growth of small woody shrubs such as *Acacia spp* and *Lyceum cinereum*. (Figure 7).

In general, the area appears to have been subject to low levels of grazing and has maintained a good cover of grasses, typical of this veld type. The dominant graminoid forms on site are *Aristida junctiformis* and *Stipagrostis ciliata.* The prevailing woody species are primarily *Lyceum* and *Acacia spp* providing some species diversity within the grassland environment. Only limited exotic invasion is evident within the site (primarily *Datura ferox*). Specimens such as *Aloe claviflora* may be present on site, however unlike the Skeerhok PV 1 site; no specimens were identified within the subject area. A list of species identified across site is presented in Table 1, below.

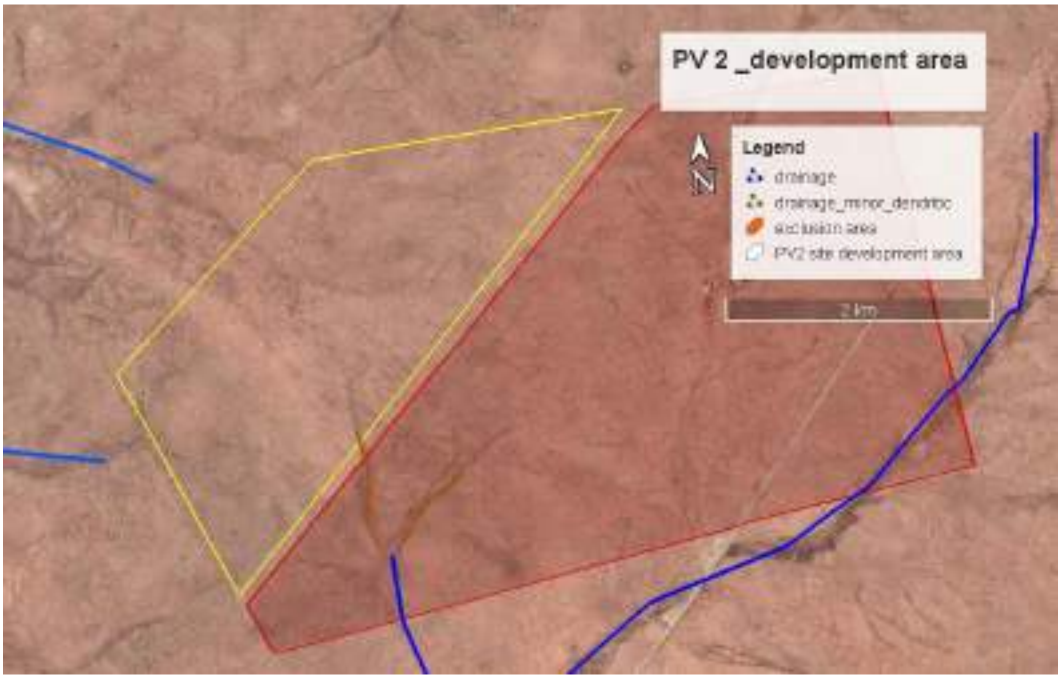

Figure 6. Map indicating the position of a minor dendritic drainage feature lying to the south of the PV3 site. These features are shallow and of limited significance – see Figure 7

Figure 7. Image indicating nature of prevailing habitat with areas of dense Lyceum- Acacia plant communities (background) indicative of drainage features.

Table 1. List of observed species within study site. Species of conservation significance are identified.

Species	Conservation Significance	
	NC NCA *	NFA#
Acacia karroo		
Acacia mellifera		
Aizoon elongatum		
Aloe claviflora	X	
Aptosimum spinescens	X	
Aristida ascensionis		
Aristida congesta		
Asparagus suaveolens		
Blepharis capensis		
Cadaba aphylla		
Datura ferox$		
Enneapogon cenchroides		
Eragrostis nindensis		
Eriocephalus encoides		
Euphorbia glanduligera		
Felicia muricata		
Lessertia annularis		
Lyceum cinereum		
Mesembryanthemum guerichianum		
Monechma incanum		
Pentzia spinescens		
Rhigozum trichotomum		
Riccia albornata		
Salsola tuberculata		
Schmidtia pappophoroides		
Stipagrostis anomala		
Stipagrostis ciliata		
Tetragonia arbuscular		
Tribulus cristatus		
Tribulus pterophorus$		

*NC NCA = Northern Cape Nature Conservation Act (1998) #NFA = National Forest Act (1998)
$ = exotic

In order to further evaluate the nature of the prevailing habitat on site, the primary collection of data relating to species composition across the proposed site was undertaken, with similar comparative exercises in the adjacent sites that have been proposed for the establishment of PV facilities. A total of 9 sites across all three of the proposed PV facilities (PV 1,2 and 3) were evaluated on a *presence – absence* basis, using a 40 m transect (Figure 2, above and in particular, Figure 8 below). Species were identified and recorded at these points. Utilising the data collected from the sites, a two way indicator species analysis (TWINSPAN) was undertaken to discern any similarities and variation between vegetation. The dendrograms depicting the results of the TWINSPAN, for vegetation communities encountered on site are presented below in Figure 9.

Figure 9, does not provide any clear indication of specific plant communities across the sample sites, with graminoid species (e.g *Aristida spp*) being evident within most associations. There is however, some indication of associations of more woody species (Acacia spp). This is typical of this grass dominated habitat and supports the contention that the subject site is generally an archetypal example of Bushmanland Arid Grassland with little transformation having been brought about through grazing or other farming activities.

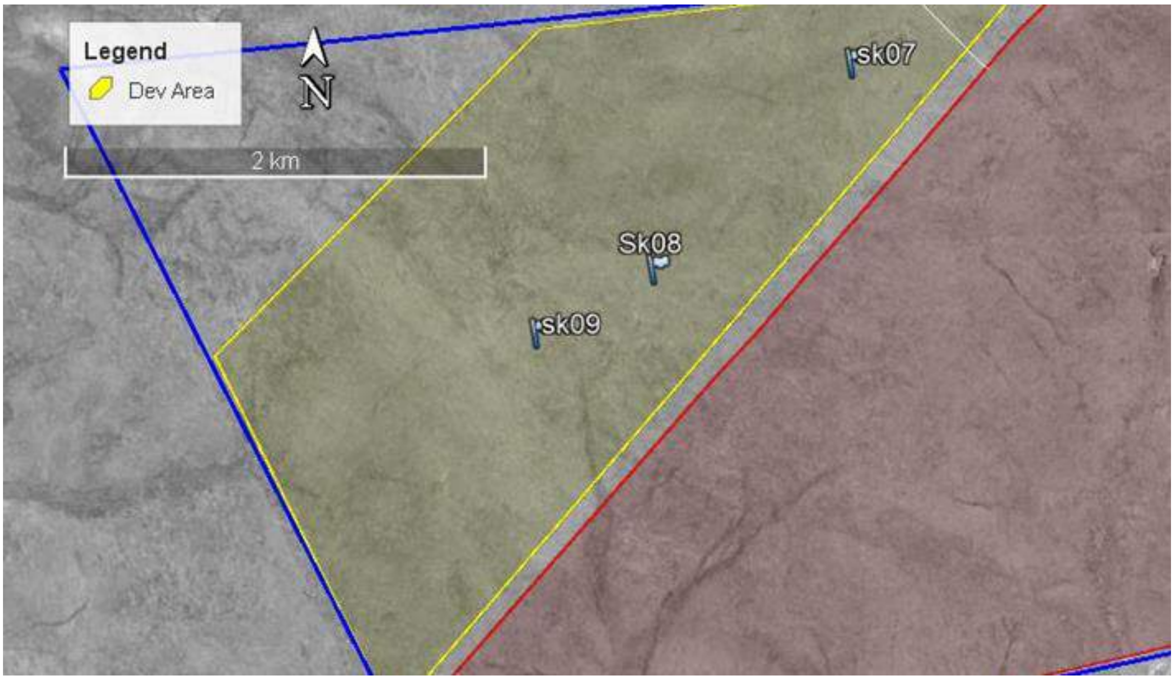

Figure 8. Map indicating sample points within Skeerhok PV 2

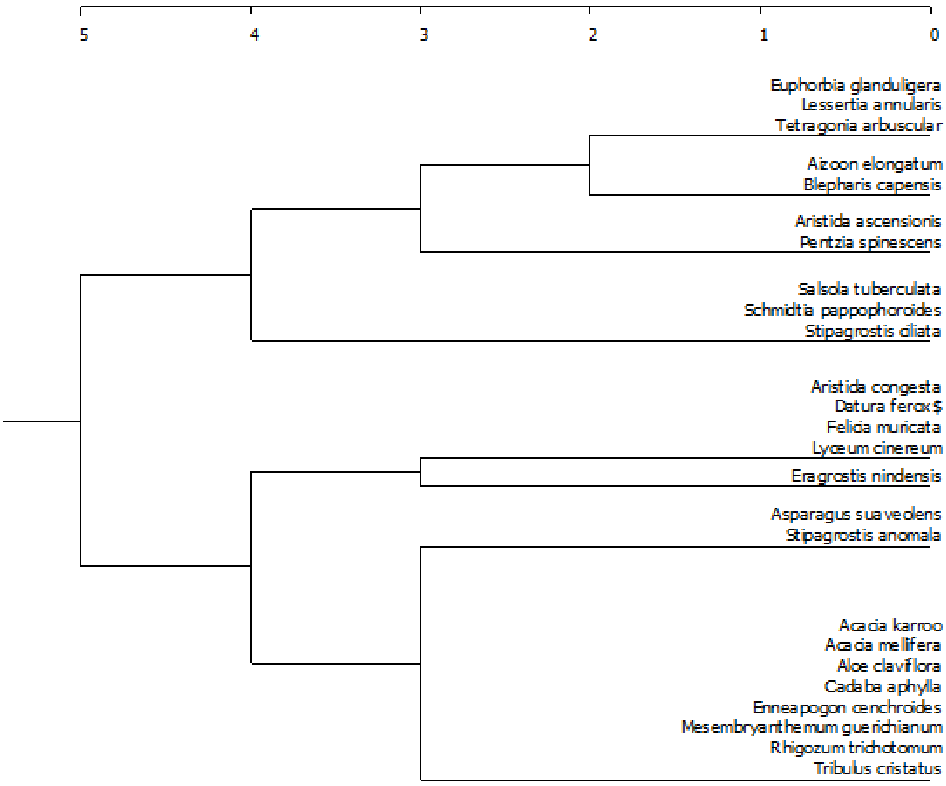

Figure 9: TWINSPAN Results presented as a dendrogram indicating vegetation species similarities and association

Further consideration of the data was undertaken using TWINPSAN in order to identify any similarities or variations between the sample sites. Figure 10 below, presents a dendrogram of these results.

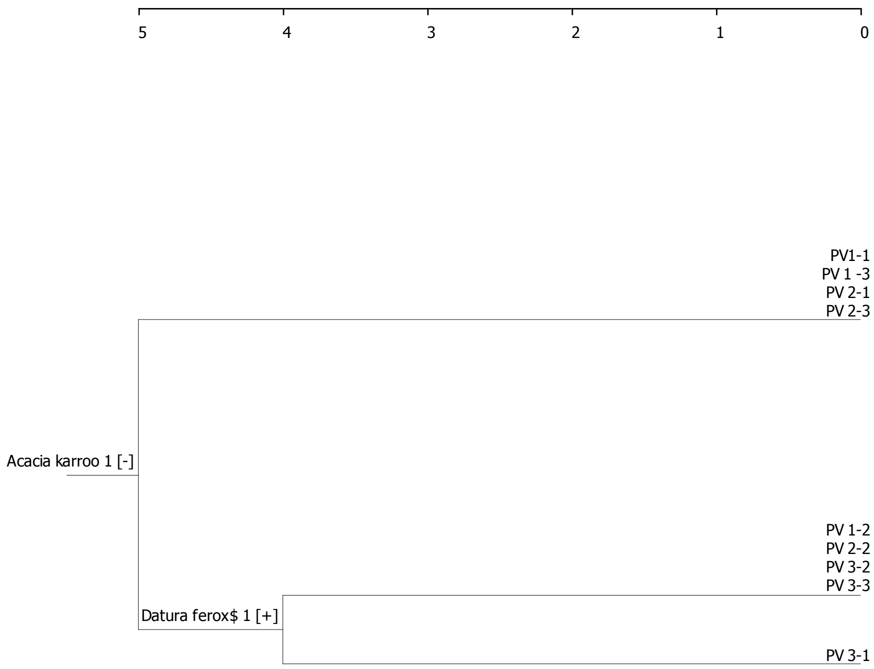

Figure 10: TWINSPAN results presented as a dendrogram, indicating sample sites according to species composition.

Figure 10 indicates that there appears to be no significant variation in the distribution of the various vegetation associations across the site. As such, it is clear that the habitat form and structure across all the proposed photo voltaic sites is very similar. Such results are indicative of the presence of uniform ecological drivers, such as soils, soil depth, elevation and geology, while livestock grazing has probably been maintained at a very low intensity across all sites.

1.3.2 "Aquatic" and Riparian Habitat

Figure 4 indicates that, of the three proposed PV sites within the Skeerhok complex, Skeehoek 2 lies to the south of a watershed which serves as a divide between the catchments that serve the Brakrivier and Soutrivier to the north, and the Hartbeerivier, to the south. Skeerhok PV 2 drains in its entirety into the Hartbeesrivier catchment, with the most proximal and significant drainage feature being the upper extent of a seasonal drainage line known locally as the Rugsrivieer. This minor drainage feature intrudes into the southern extent of Skeerhok PV 2 (Figure 11). Drainage from this points feeds into a semi-natural watercourse located some 4kilometres downstream of PV3 (Figure 11). The watercopurse at this point can be considered to have arisen primarily through the establishment of the Shishen Saldanha railway line, which has effectively bisected the drainage line and through acting as an attenuating structure, has given rise to this feature. In addition, initiatives to enhance and expand the site to improve the retention of water within the system are also evident. It is clear that some abstraction arises from the system for agricultural or other uses, when water is available (Figure 12).

Given the present state of the system and its apparent value from an agricultural perspective, it is proposed that the identified drainage feature within PV3 be maintained as a point that is unencumbered by development (Figure 11). Other drainage features within the site are considered to be of lesser significance primarily on account of their geomorphological character and there is no evidence to support any further points of exclusion within the site on account of hydrological factors.

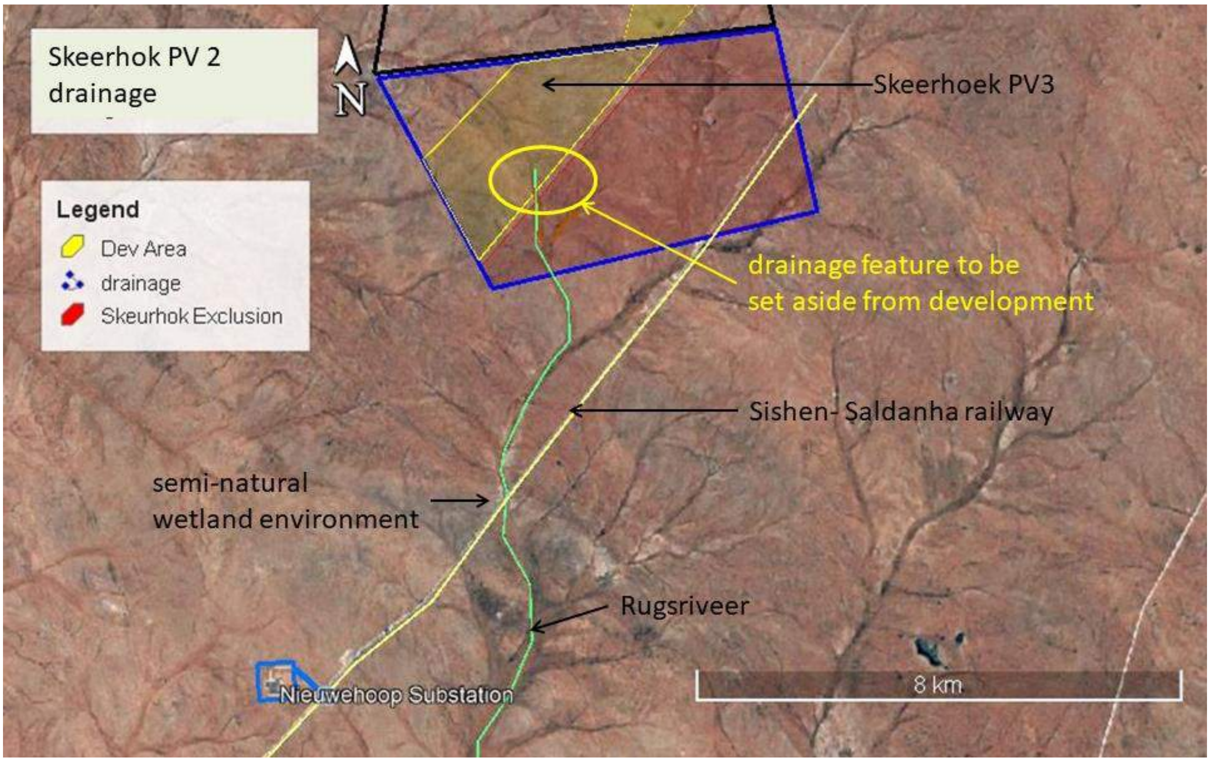

Figure 11. Map showing drainage from Skeerhok PV 2 into the Rugsrivieer system and identifying the semi natural wetland system located next to the Sishen Saldanha railway line.

Figure 12. Image of semi natural wetland / attenuation feature next to the railway line (right hand side of image). Note pump house within image.

1.3.3 Habitat Sensitivity

The general topography and habitat within Skeerhok PV 2 can be considered to be particularly uniform in nature with little in the way of significant topographic, hydrological and ecological features. Only one natural feature is considered to show some merit in being excluded from development, this being the drainage line described above. As such the balance of the site may be considered to be suitable for the establishment of the proposed photo voltaic facility. As such, a map indicating such is presented below in Figure 14, with the identification of the southern drainage line where development should be excluded from around the drainage feature by 32m. This exclusion or "buffer" is arbitrary in nature and is based on general policies associated with setbacks from river systems. Such exclusion should allow for the maintenance of any eco-morphological variation that may arise in the system as a consequence of climatic or anthropogenic changes within the catchment.

The nature of PV facilities, such as that envisaged at Skeerhok is such that much of the land occupied by the PV modules is left unimpeded by development and surface flow ostensibly follows the lay of the land (Figure 13). Some impediments to flow may arise at points around roadways or related infrastructure; however this is of limited consequence. In addition, the presence of the modules across the site, generally serves to alter plant-edaphic relationships through the concentration of water at points and increased shading, leading to improved water retention within soils. This situational change has low level ecological ramifications.

Figure13. Image of solar arrays indicating the limited influence that such structures generally have on the flow of surface waters within a solar facility.

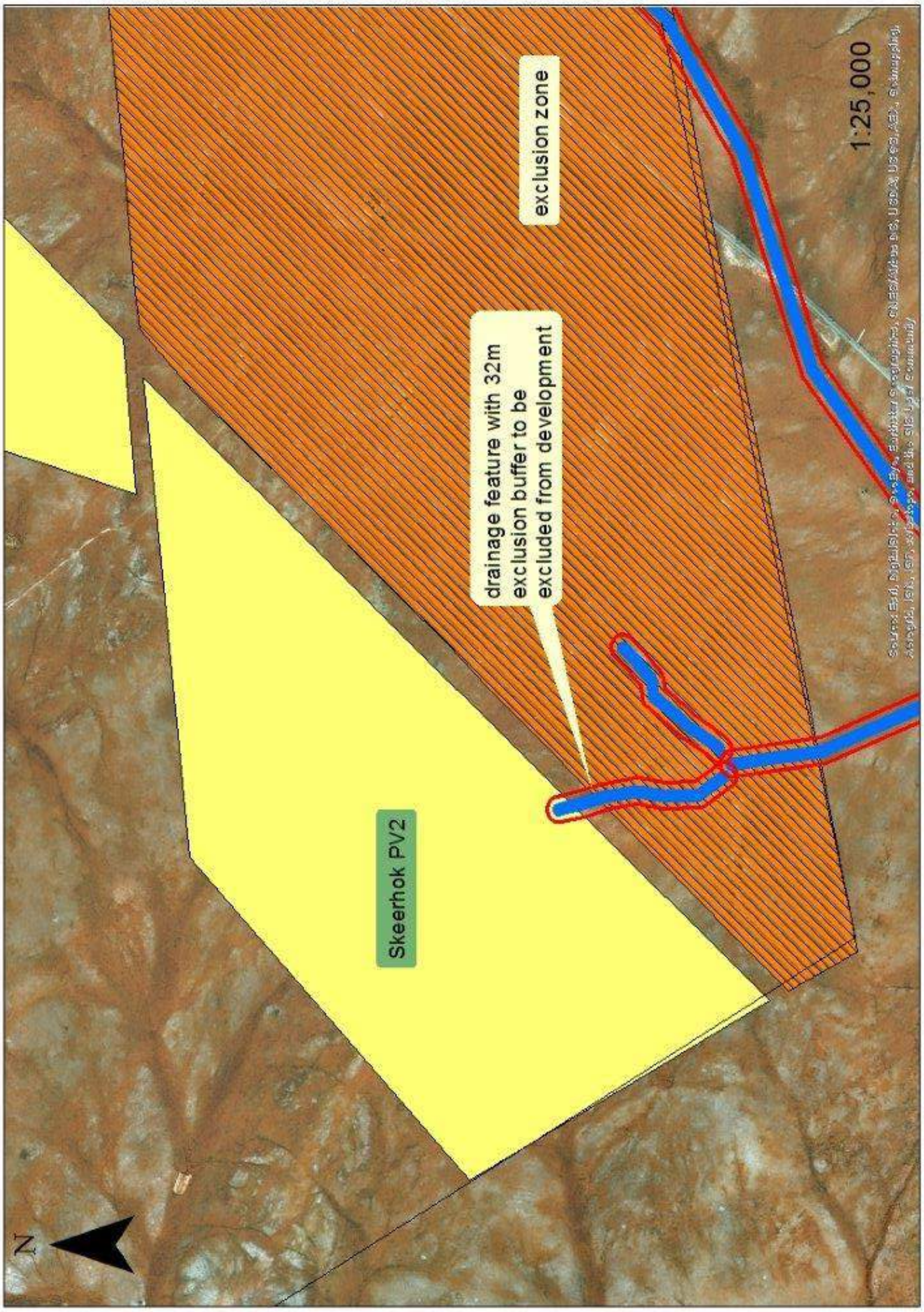

Figure 14. Spatial map of Skeerhok 2 showing "exclusion zones" around drainage features.

1.3.4 Terrestrial Fauna

Fauna that are endemic to the region are considered to be typical of a xeric environment, with limited habitat variation across the study area giving rise to a primarily uniform distribution of such species. Table 2, below indicates species observed on site or evidence of their presence and this includes species that are likely to be encountered in the broader region. The occurrence of such species within the site 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 site in general. Such species included ground squirrel (*Xerus inauris)* (Figure 15) and suricates (meerkat) (*Suricata suricata*). Also sporadically present within the site are aardvark (*Orycteropus afer*), as well as the porcupine (*Hystrix africaeaustralis*).

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 site boundaries. Estes (1992) indicates that suricates may use warrens for a number of months or possibly years, before relocating. Noted on other PV sites, suricates are quite capable of establishing warrens within solar parks following their construction, while aardvark (*Orycteropus afer)* and other fossorial species are able to excavate under fencing, which may have initially served to exclude them from the site. In some instances, animal intrusions into the PV facilities may prove to be a "risk" to both the animal and the operations of the facility. The foraging activities of aardvark may serve to expose underground cables, while in one instance the striped mouse (*Rhabdomys pumilio*) was noted to be a problem within PV facilities on account of its propensity to establish nests within cable trays and other small enclosures.

Figure 15. Ground squirrel (*Xerus inauris).*

Identified during the site reconnaissance was the Bushmanland tent tortoise (*Psammobates tentorius verroxii*), (Figure 16), one of three sub species of tent tortoise within South Africa. This relatively small tortoise is not typical of the "tent tortoise family", in terms of its carapace shape and form. Although listed in the IUCN Red List of Threatened Species (http://www.iucnredlist.org) as 'least concern", the tortoise is generally sparsely distributed across the desert regions of South Africa. Other tortoise species that are likely to occur within the subject area include the serrated tortoise (*P oculiferus*) and possible species of padloper (*Homopus spp*). Tortoises are the species of terrestrial fauna most likely to be directly affected by the establishment of PV facilities. Tortoise succumb to habitat change within the PV facility (particularly where points of refuge may be altered – e.g. the loss of scrapes and burrows in the ground or changes in forage material), while fencing in general, may restrict the range of tortoise. The presence of electric fencing may also be lethal to tortoises that directly encounter live wires, as the animal withdraws into its carapace to avoid electrocution. If the tortoise is unable to extend its neck from the shell on account of the presence of the electric fence, it is rendered immobile, leading to the animal eventually starving to death through its inability to forage. Further mortalities may arise during the construction and operation phases, as a consequence of increased vehicular traffic affecting animals both on roadways that lie outside of the site and within construction areas.

Figure 16. Bushmanland tent tortoise (*Psammobates tentorius verroxii*) identified on site.

Reptiles, smaller vertebrates and other invertebrates are also likely to show varying trends in populations across the subject site. As indicated above, habitat and climatic state are the major drivers of faunal presence within the region, with most species being transitory in any given area and their presence being subject to the availability of vegetation cover, water and other resources.

Table 2 below provides a list of the terrestrial fauna that were encountered on site or on adjacent lands, or are likely to be associated with the site. The legislation relating to these species is also presented.

Table 2. List of terrestrial species identified within site and likely to be present within the region/site. Species of conservation importance are also Identified.

		Observations	TOPS (2007)	Conservation Importance (IUCN Red List) *
Mammals				
Orycteropus afer	Aardvark	Foraging evidence?		LC
Felis nigripes	Black-footed cat			VU
Atelerix frontalis	South African hedgehog	Pers.comm J Orven 2015	Protected	LC
Canis mesomelas	Black back jackal			Not listed
Xerus inauris	Cape ground squirrel	Observed 2015		Not listed
Lepus capensis	Cape hare	Observed 2015		Not listed
Felis caracal ?	Caracal ?	Remains of prey 2015		Not listed
Procavia capensis	Rock dassie	Observed		LC
Suricata suricatta	Meerkat	Observed 2015		LC
Aethomys namaquensis	Namaqua rock mouse			Not listed
Hystrix africaeaustralis	Porcupine	Foraging evidence? 2015 and 2017		LC
Antidorcas marsupalis	Springbok	Observed		LC
Raphicerus campestris	Steenbok			LC
Cynictis penicillata	Yellow mongoose	Observed		LC
Reptiles				
Ptenopus spp	Barking gecko			LC
Naja nivea	Cape cobra			Not listed
Chondrodactylus angulifer	Giant ground gecko			LC
Cordylus spp	Girdled lizard		Protected	*C cataphractus* ; - VU
Psammobates tentorius veroxii	Karoo tent tortoise	Observed		LC
Geochelone pardalis	Leopard tortoise	Observed		Not listed
Bitis arietans	Puff adder			Not listed
Agama makarikarica	Spiny agama			Not listed
Amphibians				
Tomopterna cryptotis	Tremolo sand frog			LC
Invertebrates				
Locustana pardalina	Brown locust	Observed		Not listed
Pterinochilus spp	Baboon spider		Protected	Not listed
Seothyra spp	Buckspoor spider			Not listed
Family Vespidae	Various wasps	Observed		
Opistophthalmus spp	Burrowing scorpions?	Burrow entrance?	Protected	Not listed
Parabuthus spp	Parabuthid scorpion			Not listed
Family Hodotermitidae	Termite			Not listed

TOPS – Threatened or Protected Species (GN R151 of the National Environmental Management: Biodiversity Act (Act 10 of 2004))
IUCN – International Union of Conservation Networks
* LC = Least concern; NT = Near threatened; VU = Vulnerable; EN = Endangered
CR = Critically Endangered; EW = Extinct in the wild; NE = not evaluated; DD = data deficient

The impact of the photo voltaic facility on terrestrial fauna is considered to be "moderate to low", with the most vulnerable species that are likely to be directly affected by mortalities, being tortoise. The most significant effect of the PV facility on terrestrial fauna will however be through the exclusion of certain species from the site, which may in turn, favour other species that are capable of foraging and living within the secured PV facility. For example, predators may be excluded from the site to the benefit of prey species within the PV fence perimeter. Such state may give rise to low level skewing of populations at a localized level, with possible concomitant changes in habitat form and structure associated with such population change. A case in point may be the abovementioned populations of *R pumilio* that benefit from the exclusion of predators, improved nest sites and forage materials (increase in graminoid species over forbs) which in turn, may alter ecological processes and habitat form and structure within the PV facility.

1.4. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The proposed establishment of a PV facility within the study site is considered to elicit a requirement for compliance with the following legislation.

1. The National Environmental Management: Biodiversity Act (Act 10 of 2004)
2. The National Water Act (Act 36 of 1998)
3. The National Forest Act (Act 84 of 1998)
4. The Northern Cape Nature Conservation Act (Act 9 of 2009)
5. The Conservation of Agricultural Resources Act (Act 43 of 1983)

The potential applicability of the abovementioned acts to the subject site is provided below:

1. The 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 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 1 and 2, 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 site, 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.

2. The National Water Act (Act 36 of 1998)

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 an application for a Water Use Licence from the Department of Water and Sanitation. A Water Use Licence will be required in respect of the proposed development under Section 21 (c) and (i), of the Act, however such license should not preclude this development.

3. The National Forest Act (Act 84 of 1998)

The National Forest Act (Act 84 of 1998) governs the removal, disturbance, cutting or damage and destruction of identified “protected trees”. Listed species that may be encountered with the site include Boscia spp and possibly *Acacia erioloba*.

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.

4. The Northern Cape Conservation Act

The Northern Cape Conservation Act under its pertinent regulation governs the disturbance of species listed in Tables 1 and 2 above, or possibly other species not yet identified on site. In particular, the relocation or redress of species such as *P tentorius verroxii* will require a permit in terms of this Act to allow for the relocation or confinement of these and other species. Such requirement may arise where the authorisation holder may wish to remove species from site and relocate to another site, or possibly hold specimens for a short period. Permits of this nature have been issued to other Independent Power Producers in order to remove nuisance species such as aardvark.

5. The Conservation of Agricultural Resources Act

Invasive plant species that should be removed or maintained only under certain commercial situations are identified in terms of the Conservation of Agricultural Resources Act (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.

As the proposed sites are not within protected areas, nor within 5 kilometres of a protected area, are not within 10 kilometres of a World Heritage site and do not form part of a critical biodiversity area (CBA), the various regulations within the National Environmental Management Act and the NEM Protected Areas Act are not applicable to this site. It is also noted that the site does not fall within any expansion area in terms of a conservation strategy for the Northern Cape.

1.5. IDENTIFICATION OF KEY ISSUES

1.5.1. Key Issues Identified During the Scoping Phase

As indicated in both this report and the environmental scoping report, the subject site is to be considered a xeric to semi-xeric environment, with limitations in the presence of aquatic or wetland environments in both temporal and spatial terms. With this in mind, the consideration of issues arising from the proposed development is considered at an integrated level, as they may arise. The following key issues were identified during the Scoping Process and are summarized below:

1.5.1.1 Construction Phase

The following potential impacts during the Construction Phase can be summarised:

- Alteration of habitat structure and composition;
- Ousting (and recruitment) of various fauna;
- Changes in the geomorphological state of 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.

1.5.1.2 Operational Phase:

The following potential impacts during the Operational Phase can be summarised:

- 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 on account of 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.

1.5.1.3 Decommissioning Phase

Such alterations and changes will be dependent upon the expectant post-decommissioning land use. However, abandonment of the site would probably result in:

- 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.

1.5.1.4 Cumulative Impacts

The cumulative impacts associated with the proposed Skeerhok PV Projects must be seen against the background of the establishment of other, similar PV projects within the region. It is evident that the incorporation of other land use changes within the region cannot be applied in terms of evaluating cumulative impacts on account of the nature of the prevailing land use (primarily livestock ranching) and the rural and hence sparse and sporadic nature of such changes as they may apply to the region. The method employed in evaluation of the cumulative impacts of a number of similar PV projects in the region is described below.

The consideration of cumulative impacts is of relevance to expansive projects such as this on account of the fact that they generally result in the homogenisation of the landscape, which in turn gives rise of habitat loss and the reduction in biodiversity (Selman 2006). Such homogenisation within the terrestrial environment also has bio-physical ramifications in the aquatic environment.

A total of 12 other large scale PV facilities were identified (within 20km of the three proposed Skeerhok PV projects) as having been authorised or are currently under consideration by one or more authorities. In total 15 PV projects lies within this delimited area. These projects are identified in Figure 16 below.

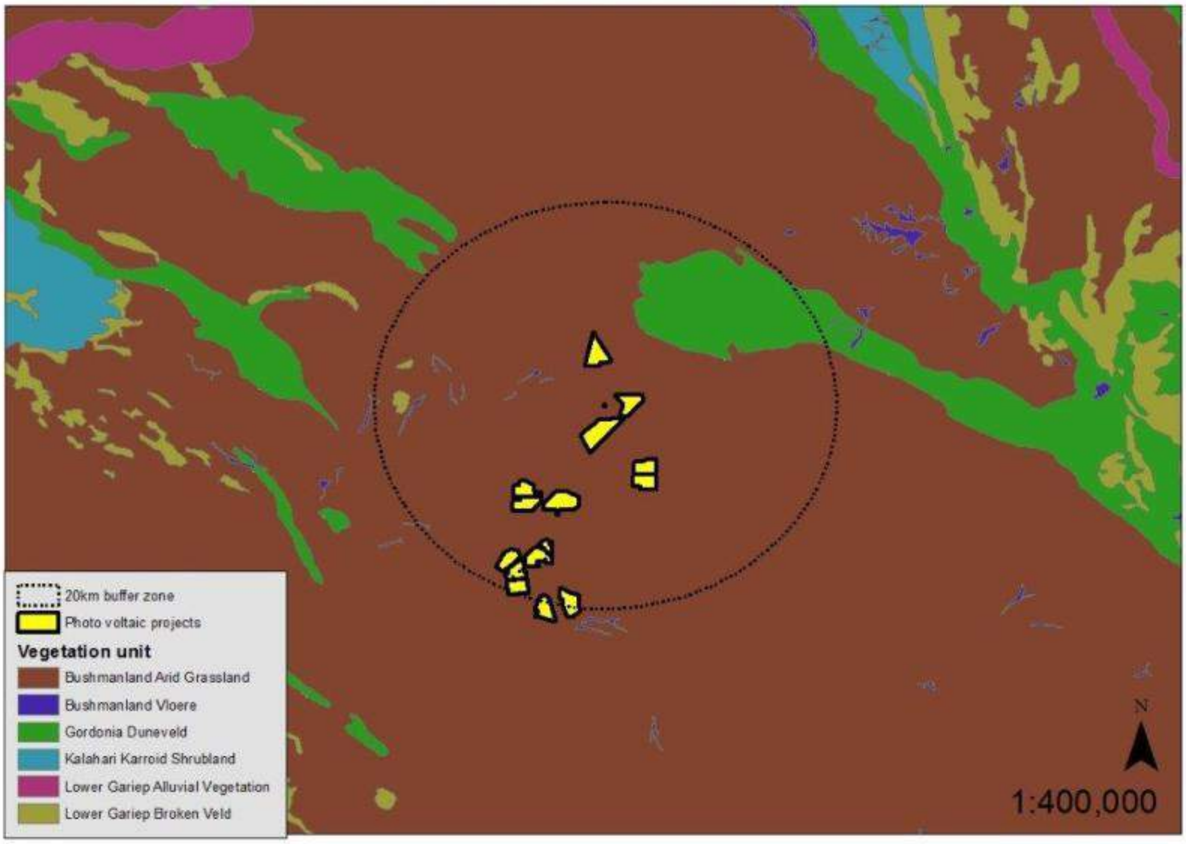

Figure 17. Map indicating position of the proposed photovoltaic projects located within a radius of 20 kilometres of the Skeerhok site

Cumulative impacts from a terrestrial ecology perspective

The identified sites have not been subject to further interrogation and it is therefore unclear as to whether some areas within these sites have been set aside or excluded from development. However, based on the information at hand, it is evident that:

- Individual PV sites vary between 240 ha and 500ha in extent
- All sites fall within the Bushmanland Arid Grassland veld type (Figure 16)
- Five local catchments are affected by these facilities, namely the catchments of the Soutrivier, Brakrivier, Wolfkopseloop, RugseerRivier and N'Rougas se loop. These catchments are indicated below in Figure 18.

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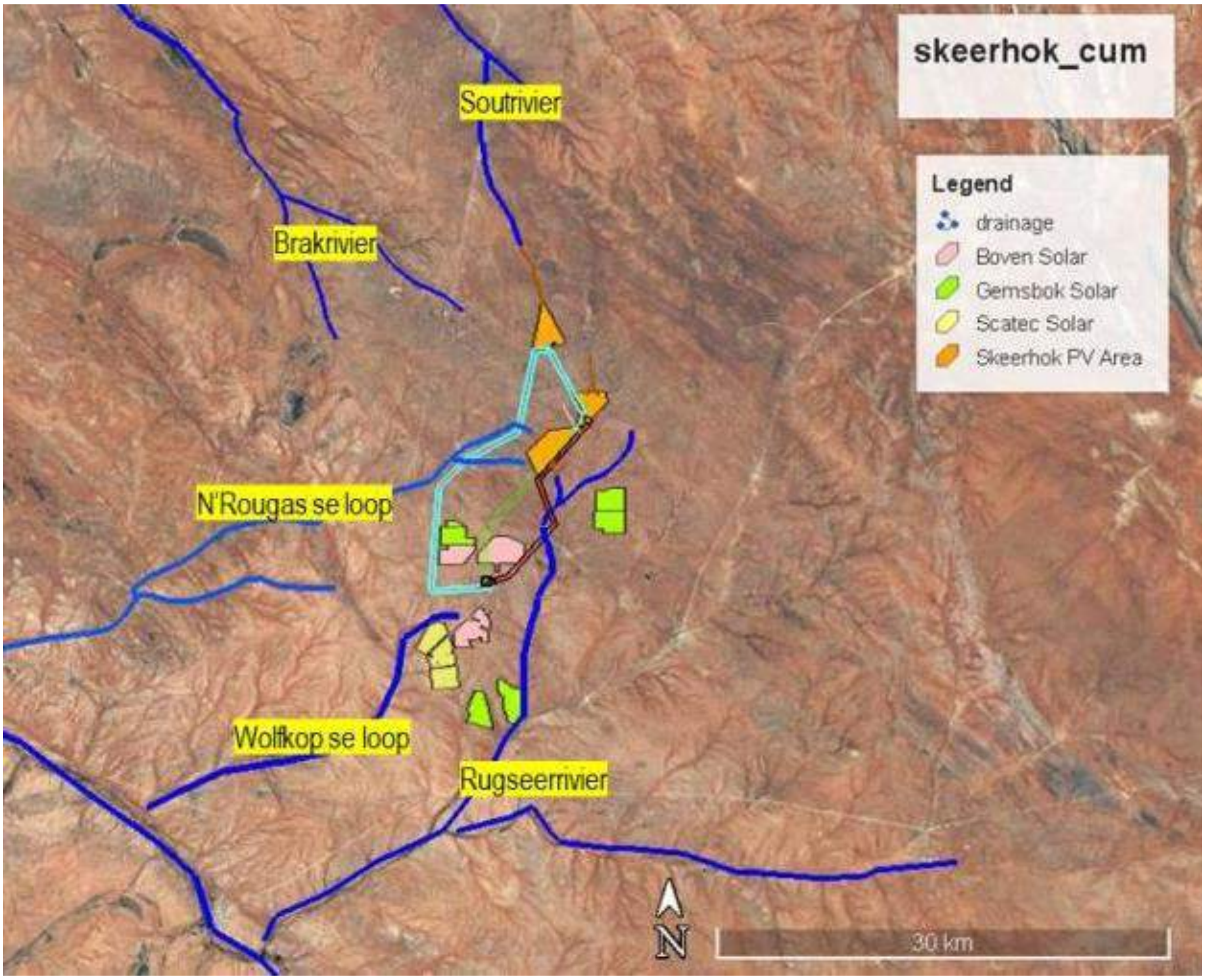

Figure 18. Map indicating the various PV projects that fall within 20km of the Skeerhok site and the relevant catchments

Figure 19 below identifies the contribution that each of the 15 PV projects that fall within the identified 20km radius towards the transformation of Bushmanland Arid Grassland and the homogenisation of the landscape. From Figure 18 it is clear that Skeerhok PV 3, Gemsbok PV 1 and Gemsbok PV2 are the three largest PV projects falling within the study area, with a combined area that approximates 20% of all 15 areas identified as being under consideration as PV facilities. The total area of all 15 PV facilities amounts to 4815 ha, which approximates 0.12% of the identified area that constitutes Bushmanland Arid Grassland veld type.

While the habitat affected by the PV facilities may be small from a quantitative perspective, some consideration should be given to the following qualitative but cumulative impacts that are likely to arise, these include:

- The "homogenisation of the landscape", as explained above.
- The increased dissection of habitat on account of increasing levels of infrastructure. The proposed PV facilities and powerlines, as well as associated service roads and other infrastructure will give rise to the further dissection of habitat within the region.
- The increased presence of exotic and disturbance driven plant species. With increasing levels of anthropogenic activity on various sites and within the surrounding area, the propensity for plant invasion or the dominance of species that are tolerant of higher levels

of disturbance will see such species dominating and perhaps ousting other less tolerant species.

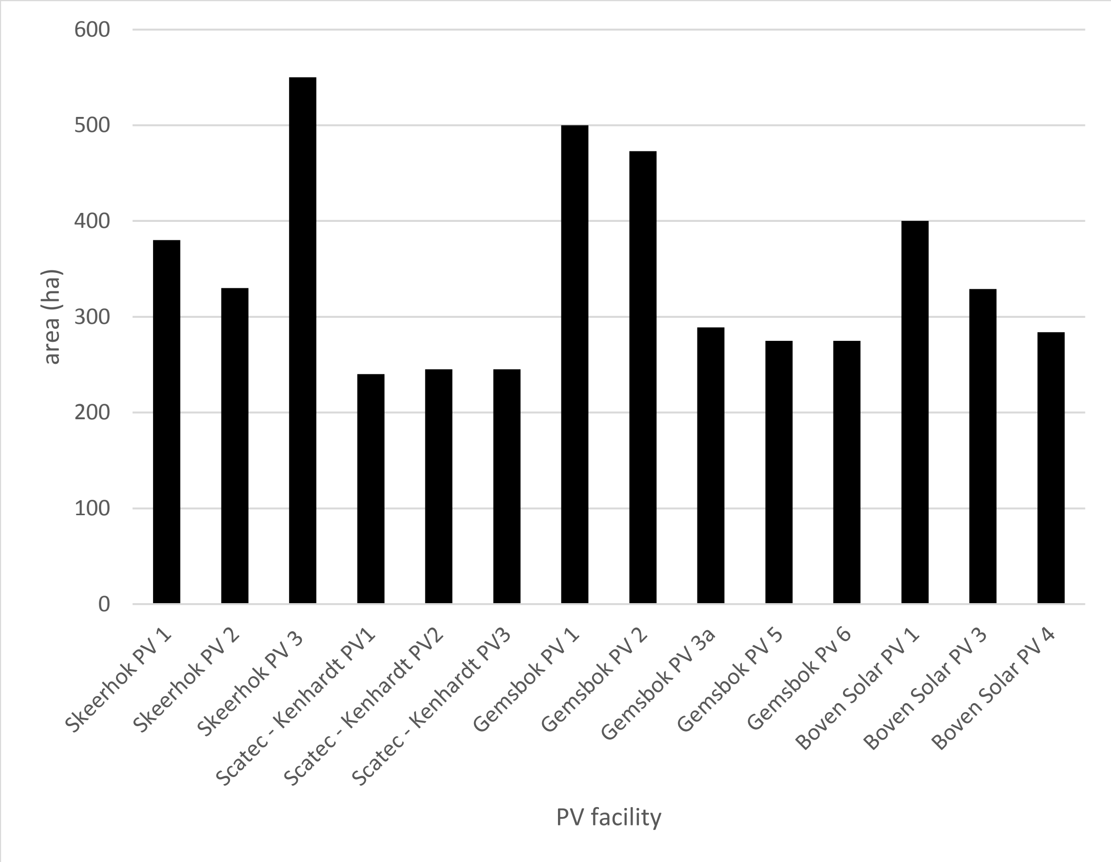

Figure 19. Graph indicating extent of PV projects and contribution of each project to the potential transformation of Bushmanland Arid Grassland veld type.

- Increased and expanded anthropogenic influences across the region. The nature of the surrounding PV facilities, electrical infrastructure and other support infrastructure suggests that human activity will arise at points that are presently only intermittently visited by a farmer or his staff. Greater levels of human activity can be anticipated across the area, with the likely influence of ousting particular species of fauna.

- Increased ELP levels. Light pollution may be associated with all built structures associated with the proposed projects. The cumulative level of increased lighting in the area will serve to alter the behaviour of a number of nocturnal (and possibly crepuscular and diurnal) species and alter ecological processes in and around these points.

- Increased noise pollution levels with concomitant impact on faunal behaviour. Allied to increasing human presence across the various sites, increasing noise levels, in particular the low level sound emanating from buzz bars and the proposed on-site substations, together with the other electrical infrastructure associated with the projects, may influence behaviour in respect of smaller mammals and other fauna that utilise sound in their various behavioural patterns (prey detection, social interaction).

- Vegetation and habitat alteration - change in ecological processes and habitat – reversion to secondary habitat structure at transformed sites.

- Recruitment and behavioural change in fauna - changes in ecological processes and habitat.

Cumulative impacts from a hydrological perspective

The establishment of the 15 PV facilities within the region, will see an altered surface hydrology arising within the landscape. Increasing areas that have been levelled or are dominated by built structures, will see localised changes in surface hydrology across specific points within the region. As shown in Figure 17, five major local drainage features are evident within the study area, which in turn serve either the Hartbees River to the west or discharge directly into the Orange River to the north and north east. Ultimately all surface flow discharges into the Orange River. Figure 20 identifies the local catchment most affected by PV facilities within the 20km radius of the Skeerhok Projects.

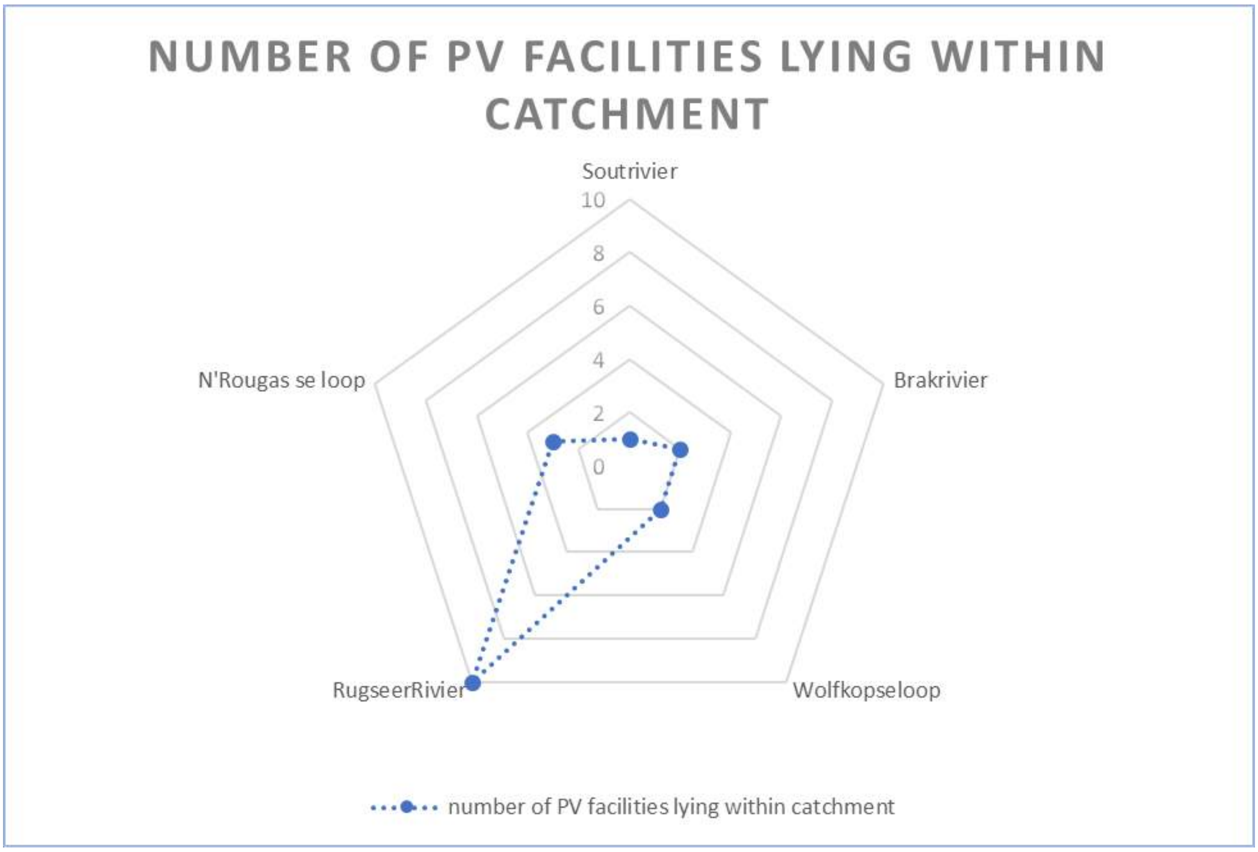

Figure 20. Graph indicating catchments affected by PV facilities.

From Figure 19, it is evident that the Rugseer Rivier to the south of the study area is most affected by the proposed solar park developments, with 10 of the proposed projects lying entirely or in part within its catchment. Notably, Skeerhok PV 1 drains northwards into the upper catchment of the Soutrivier and is the only project within the catchment of this system.

Though many of the cumulative impacts associated with these developments are difficult to forecast and cannot be avoided, the introduction of mitigatory measures at a site specific basis may assist in moderating the impacts described above at a landscape level. . In evaluating the impact of the 15 projects identified and adjudicating on a limitation of the number of projects to 6, as stipulated by the DEA, such decision-making, from an ecological perspective should best be undertaken through a review of *inter alia*; extent of development, level of transformation within existing sites, eco-morphological factors within the individual sites and impacts on individual catchments. It follows that those sites which have the lowest extent and have limited eco-morphological impacts would perhaps be preferred, while from a regional perspective it is possibly prudent to avoid the concentration of solar parks into particular catchments, preferring to disseminate surface hydrological change across a number of catchments.

1.6. ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

The proposed development of the PV facility on the study site indicates that the land use change is applicable across the site, with the exception of the minor drainage line identified to the south of the site. It follows that engineering design and other factors will determine the final layout of the site, while excluding development from within 32m of the abovementioned drainage feature. A number of other have also been identified in Section 1.5.1. These potential negative impacts are given further consideration below, with possible mitigation measures being proposed.

Construction

1.6.1. The ousting of fauna and loss of vegetation/habitat through anthropogenic activities, disturbance of refugia and general change in habitat with concomitant ecological repercussions.

During the construction phase, a high level of disturbance is likely to arise over a period extending up to 18 months. Such disturbance will relate to excavation, noise and general anthropogenic influences associated with the building of the facility on site. This may include the cutting and removal of vegetation for the establishment of internal gravel roads (a permanent transformation) and the cutting and trampling of vegetation wherever the arrays may be established. Direct, indirect and cumulative impacts expected to arise on site are identified below:

Direct Impacts

- Loss of "*less resilient*" plant species and replacement with more *robust* species leading to a change in habitat form and structure.
- Introduction of exotic vegetation or the invasion of disturbed areas by exotic vegetation through either a physical vector (e.g. machinery, vehicles etc.) or more "natural" dispersion vectors (e.g. wind, avian dispersion).
- Ousting of fauna through disturbance and human presence. As such, the loss of fossorial and other species will alter the ecological processes inherent within the site (e.g. change in disturbance thresholds, herbivory etc.).
- Opportunistic animal species may benefit from the construction activities; in particular the exclusion of predators from the site may benefit former prey species which will take refuge within the area, skewing populations and predator – prey relations.

Indirect Impacts

- Changes in habitat form and structure may extend beyond the site boundaries as species prevalence changes within the PV site. This change will skew plant competition in areas around the site as propagule levels change and species competition in the immediate vicinity of the site alters.
- As indicated in the direct impacts, faunal populations may be favoured by the establishment of the facility and as such these changes will be evidenced beyond the boundaries of the PV facility.

Cumulative Impacts

- Presently the study site and surrounds are subject to limited anthropogenic impacts with the exception of the adjacent electrical infrastructure, road infrastructure, fences and livestock management operations. A number of other photovoltaic power projects are approved and envisaged for the immediate region, as per Figure 16 above. A number of these projects may commence prior to the construction of Skeerhok 1, while others may not. Should these sites be developed prior to the development of the Skeerhok PV project, it is envisaged that:
  - o Exotic species invasion may arise from adjacent projects (if not controlled on site), particularly as a consequence of both winds, livestock and anthropogenic movement; and
  - o Fauna ousted from these sites may, in part relocate towards the subject site, and in turn be ousted from this site. As such faunal populations within the immediate region may be placed in flux. Such impacts should in the medium term, dissipate provided that suitable habitat remains available to such populations.

The status of this impact is rated as negative and direct, indirect and cumulative in nature. The direct impact is rated with a site specific spatial extent; the indirect impact is rated with a local spatial extent, and the cumulative impact is rated with a local to regional spatial extent. The impacts are rated with a long-term duration (i.e. the impact and risk will occur for the project duration). The consequence and probability of both the direct and cumulative impacts are respectively rated as substantial and very likely. The consequence and probability of the indirect impact are respectively rated as substantial and likely. The reversibility of the direct impact is rated as low and the irreplaceability is rated as low. The reversibility of both the indirect and cumulative impact is rated as moderate and the irreplaceability is rated as low.

Significance of Impact without Mitigation: Moderate

Mitigation

Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. A preconstruction site walk-through should be undertaken shortly before commencement of construction and preferrably in or around February to March in order to identify any additional plant specimens of significance that may be evident on site. Such specimens may be relocated/removed (i.e. search and rescue) or avoided (with the relevant permits and approvals in place) prior to the commencement of construction.

2. The detailed design of the laydown footprint of the arrays should take consideration of the general drainage from the site, preventing the unnecessary impeding of flow, particularly at the more southern points of the site, closer to the watershed. Any significant plant specimens that may be identified prior to the commencement of construction should be given consideration either in respect of removal, preservation or relocation. Other features of the site should be incorporated into the PV array design.

3. Although the area remains generally unaffected by significant exotic weed invasion, an initial pre-construction clearance of all exotic vegetation on site should be undertaken to reduce the possibility of further exotic weed invasion. Continued exotic weed control measures should be implemented during the construction phase and may be incorporated into an exotic weed control plan for the site.

4. The ousting of larger game from fenced areas within the PV facility, should be undertaken through a general sweep of the laydown area once the fence is erected.

Species that are likely to remain within the site include steenbok and fossorial species such as aardvark.

5. The maintenance of vegetation and avoidance of the "blading" or clearance of vegetation by machinery. Vegetation is generally of such low level that blanket clearance is unnecessary.

6. Consideration of the siting and layout of the temporary construction site and worker camp.

Significance of the impact with mitigation **Low**

1.6.2. Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure within the site and immediately adjacent to it.

Significant drainage features on site will be avoided in the layout of the proposed PV facility. It is however, evident that some surface flow change will arise on account of excavation, plant and human movement and the placement of structures. Direct, indirect and cumulative surface hydrological impacts expected to arise on site are identified below:

Direct Impacts

- Minor variation in the flow regimen within small dendritic drainage features is likely to arise, but such change may possibly be compounded within larger features, that lie ostensibly off site.
- Increased sediment discharge into surface drainage features as a consequence of disturbance to soils and moderate to heavy rainfall. This may alter habitat for certain species that are related to the drainage lines.

Indirect Impacts

- Shifts in habitat form and structure as plant – water relations change across portions of the site.

Cumulative Impacts

- Sustained changes in the upper drainage pattern and watershed will see minimal changes in the major drainage lines. This may be compounded further downstream in the Brakrivier system, particularly if other, similar developments within the same catchment arise. Changes may be manifest in the increased rate of flow within the system with consequences in terms of bed and bank morphology.

The status of this impact is rated as negative and direct, indirect and cumulative in nature. The direct impact is rated with a site specific spatial extent; the indirect impact is rated with a local spatial extent, and the cumulative impact is rated with a regional spatial extent. The direct, indirect and cumulative impacts are respectively rated with a medium-term, short-term and long-term duration. The consequence and probability of both the direct and indirect impacts are respectively rated as moderate and likely. The consequence and probability of the cumulative impact are respectively rated as substantial and likely. The reversibility of the direct and indirect impact is rated as high, whilst the cumulative impact is rated with a low reversibility. The irreplaceability of the direct and indirect impact is rated as low, whilst the cumulative impact is rated with a moderate irreplaceability.

Significance of Impact without Mitigation (Direct and Indirect Impacts): Low

Significance of Impact without Mitigation (Cumulative Impacts): Moderate

Mitigation

Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Exclusion of major drainage lines from the development footprint. This has ostensibly been achieved as a consequence of the nature of the site and the selection of areas within the Skeerhok complex for the establishment of the PV facility.

2. Avoidance of significant sculpting of land and maintenance of the general topography of the site.

3. Engineering interventions such as the placement of energy dissipaters (such as stone levees or similar structures) within minor drainage lines affected by the PV facility, to reduce velocity of flow through such features.

4. Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible).

5. Maintenance of a high level of housekeeping on site during the construction phase.

6. 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.

Significance of Impact with Mitigation (Direct and Indirect Impacts): Very Low

Significance of the impact with mitigation (Cumulative Impact): Low

1.6.3. Alteration of surface water quality on account of construction activities that lead to change in water chemistry.

Allied to the above, the construction phase will result in changes in water chemistry that will relate to:

Direct Impacts

- The physical alteration of surface run off (sediments, turbidity etc.).
- A change in dissolved substances within surface waters on account of the excavation of onsite soils and the import of soils and hardpan materials to site.
- A change in dissolved substances within the surface waters due to spillage of hydrocarbons and disposal of other liquids and foreign materials on site.
- Solid wastes, in particular plastics and paper, arising from site, are likely to arise within drainage systems.

Indirect Impacts

- Water quality in the lower reaches of the Brakrivier and Soutrivier systems may be subject to minor alteration in water chemistry, dependent upon rainfall in the catchment.

Cumulative

- The run off from all PV facilities as well as other infrastructure, whether developed in tandem or subsequent to one another, will see small changes in water chemistry associated with run off from these sites.

- Changes in water chemistry will be more evident in the permanent water bodies, downstream of the sites; however dilution factors will make these particular impacts negligible.

The status of this impact is rated as negative and direct, indirect and cumulative in nature. The direct and indirect impacts are rated with a local spatial extent; whilst the cumulative impact is rated with a regional spatial extent. The direct and indirect impacts are rated with a short-term duration, and the cumulative impact is rated with a long-term duration. The consequence and probability of both the direct and indirect impacts are respectively rated as slight and likely. The consequence and probability of the cumulative impact are respectively rated as moderate and likely. The reversibility and irreplaceability of both the direct and indirect impacts are respectively rated as high and low. The reversibility and irreplaceability of the cumulative impact are rated as moderate. The irreplaceability of the direct and indirect impact is rated as low, whilst the cumulative impact is rated with a moderate irreplaceability.

Significance of Impact without Mitigation (Direct and Indirect Impacts): Very Low

Significance of Impact without Mitigation (Cumulative Impact): Low

Mitigation:

Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Undertaking and completion of earthworks and road construction outside of the high rainfall period in January to March if possible and practical.

2. Maintenance of a high level of housekeeping on site during construction, including management and maintenance of vehicles, storage of dangerous goods including bulk liquids and disposal of wastes.

3. Inspection of drainage features immediately outside of the footprint of proposed PV facility and undertake removal of solid waste materials (if identified) on a regular basis.

4. Exclusion of major drainage lines from the development footprint.

5. Avoidance of significant sculpting of land and maintenance of the general topography of the site.

6. Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features.

Significance of Impact with Mitigation (Direct and Indirect Impacts): Very Low

Significance of the impact with mitigation (Cumulative Impact): Very Low

1.6.4. Depending upon the origin of water (import or through abstraction of groundwater), changes in subsurface water resources may arise, particularly in the case of the latter.

The construction of the proposed PV facility will require significant volumes of water, particularly for the construction of roadways. If local boreholes are utilised for the provision of such water, these resources may be placed under pressure, while the import of water to the site may alter the recharge of water to subsurface resources.

Direct Impacts

- Abstraction from site is unlikely as the aquifer is considered to be low to moderate in yield at a preliminary level of consideration. However, increased demand on these aquifers will serve to reduce water availability, if such aquifers are located close to the surface. Such draw down of the aquifer may alter the plant water relations of larger specimens that rely on such resource.
- 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.

Indirect Impacts

- Abstraction of water from subsurface resources may have consequences for areas beyond the site perimeter, depending on the extent of the aquifer under consideration. Depletion of the aquifer may affect habitat forms at lower points within the catchment.

Cumulative Impacts

- Continued and sporadic abstraction of water by a number of users from the same aquifer may affect water resources downstream of the site, as well as the availability of water to other sites.

The status of this impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as substantial and likely. The reversibility and irreplaceability of the impact are both rated as moderate.

Significance of Impact without Mitigation **Moderate**

Mitigation

Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Identification of suitable water resources, preferably off site and not utilized by other PV facilities, if possible. Confirmation of yield will be required prior to abstraction.

2. Use of recycled water for construction purposes from identified resources e.g. sewerage facilities or similar facility, if possible.

3. Identify or consider alternative cleaning methods for the PV panels, that are less water intensive.

Significance of the impact with mitigation **Low**

1.6.5. Changes in edaphics (soils) on account of excavation and the import of soils, leading to the alteration of plant communities and fossorial species in and around these points.

The construction phase will include the import of soils from other sites, as well as the compaction of soils. The related direct, indirect and cumulative impacts are identified below.

Direct Impacts

- Depending upon the nature of soils (particle size, clay and mineral content etc.) changes in habitat form may arise at a localized level, as plant species that are tolerant of or prefer particular soils benefit at the expense of other species which are less tolerant.
- Compaction of soils by traffic and through the use of compactors, will allow for some plant species to competitively benefit over other species.

Indirect Impacts

None identified, unless soils are disturbed outside of the development footprint.

Cumulative Impacts

- In a sandy environment, such as the Bushmanland Arid Grassland, differing soil forms will see some plant species benefit at the expense of others. With a number of similar projects underway within close proximity of each other, associations of particular species may become more prevalent on site, in clustered areas within the development sites.

The status of the direct impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

The status of the indirect impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as low.

Significance of Impact without Mitigation (Direct and Cumulative Impacts): Low

Significance of Impact without Mitigation (Indirect Impact): Very Low

Mitigation

Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Ripping of compact soils when and where extensive compaction arises.

Significance of the impact with Mitigation (Cumulative Impacts): Very Low

Significance of Impact with Mitigation (Direct Impact): Low

1.6.6. Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna.

As indicated above, operations at the site during the construction phase will require the placement of security lighting, as well as the undertaking of operations at dusk and before dawn. Lighting will be required at points around the site.

Direct Impacts

- Increased lighting around the laydown area and possibly across the site will change faunal behavior. Nocturnal and crepuscular species may either benefit or be suppressed as a consequence of such lighting. For example, Chiropterans (bats) may be encouraged or attracted to site as a consequence of increased prey items being present in and around lighting, or certain species may become more vulnerable to predation as a consequence of lighting.

Indirect Impacts

- As a consequence of lighting at the site, species may be drawn from other areas or alternatively ousted from points proximal to the site as a consequence of changes in behavior of one or more species, affected by ELP.

Cumulative Impacts

- With a number of PV projects being clustered in the area, it is envisaged that the ELP and the presence of a wider landscape based light imprint or “aura” may become a significant component of the regional environment. This may serve to change faunal behavior over a wide portion of the area in question.

The status of the direct impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

The status of the indirect impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as very low.

Significance of impact without mitigation (Direct Impact): Low

Significance of impact without mitigation (Indirect and Cumulative Impacts): Very Low

Mitigation

1. Lighting and its placement and use on site should be given consideration, whereby ELP is minimized. This may entail managing the position of lights, their direction and luminescence. The project should strive to minimise ambient situational light emissions.

Significance of impact with mitigation (Direct, Indirect and Cumulative Impacts):
Very Low

1.6.7. Exclusion or entrapment of (in particular) large fauna on account of the fencing of the site.

The placement of a fence around the site is one of the preliminary tasks affecting the site. Such fence serves to entrap some species within the laydown area, while other specimens can "escape", (Figure 20) others still, are enticed into the fenced area. This has some minor impacts, which are identified below.

Figure 21: Excavation and movement under fences by larger animals, porcupines and Aardvark (*Orycteropus afer*).

Direct Impacts

- Fossorial species, such as aardvark (*O. afer*), can disrupt activities through their foraging activities. This is particularly evident around fences.
- The exclusion of some fauna serves to alter habitat state as the fossorial behavior of some fauna is an ecological process requirement (e.g. excavation of soils by some animals allows for the settlement and germination of seeds, while termites etc. are controlled by species such as *aardvark*.

Indirect Impacts

- The ousting of certain fauna from the site requires that such specimens forage within other areas, resulting in various behavioural changes (e.g. territorial overlaps etc.).

Cumulative Impacts

- As a large and contiguous area will eventually fall under a similar land use, with exclusion areas for larger fauna, inter-specific and intra-specific competition may increase within the local area.

The status of the direct impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

The status of the indirect impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as very low.

Significance of impact without Mitigation (Direct, Indirect and Cumulative):
Very Low

Mitigation

1. Ensure that the live electrical fence wire is not placed at ground level.

2. Conduct regular inspections of the fence line, possibly combined with the daily security inspections, to address any animals that may be affected by the fence (i.e. tortoise) and alert the site management team of any concerns.

Significance of impact with Mitigation (Direct, Indirect and Cumulative):
Very Low

<u>**Operational Phase**</u>

1.6.8. 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 i.e. larger fossorial species and predators will be excluded from the PV facility site by virtue of its fencing, generally leading to possible variations in populations of other species that remain within the site, with concomitant ecological change.

As per the construction phase impacts, impacts arising from the cordoning of the site from faunal intrusion may see changes in the general ecological state of vegetation structure and form on site. Potential direct, indirect and cumulative impacts are described below:

Direct Impacts

- Changes in plant community structure as drivers of certain species are excluded from the subject area, for example herbivory is curtailed on certain plant species.
- Introduction of exotic vegetation where moribund vegetation arises as a consequence of changes in local ecological drivers.
- Opportunistic animal species may benefit from the exclusion of other species, such as prey species. This may lead to a skewing of populations within the site.

Indirect Impacts

- Changes in habitat form and structure may extend beyond the site boundaries as species prevalence changes within the proposed PV site. This change will skew plant competition in areas around the site as propagule levels change and species competition in the immediate vicinity of the site alters.
- Faunal populations may be favoured by the establishment of the facility and as such these changes will be evidenced beyond the boundaries of the PV facility.

Cumulative Impacts

- Should the additional expected PV facilities be established, together with the subject site, it is evident that a significant portion of land will be subject to the exclusion of certain fauna, with the concomitant cumulative effects identified above being more spatially extensive in nature.

The status of the direct impact is rated as negative, with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

The status of the indirect impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are both rated as low. The significance of the indirect impact without mitigation is rated as moderate.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are both rated as low. The significance of the cumulative impact without mitigation is rated as moderate.

Significance of impact without mitigation (Direct Impact) Low

Significance of Impact without Mitigation (Indirect and Cumulative Impact): Moderate

Mitigation

1. Provision of critter paths within the fencing should be considered in the design. Similar paths have been instituted in other PV facilities to good effect. Its use relates primarily to the movement of small mammals (suricates and ground squirrel) as well as the Giant African bullfrog (*Pyxicephalus adspersus*). These species have been noted to utilise the critter paths (Figure 22), however burrowing and other activities continue in respect of larger fauna, regardless of such mechanisms.

2. Promote and support faunal presence and activities within the proposed PV facility, where applicable. For example, the retention of suricate warrens (within reason) and possibly low, endoreic pans, where they may arise.

Significance of impact with Mitigation (Direct, Indirect and Cumulative) Low

Figure 22. Image of 'critter path" within fence. Note spoor of smaller animals indicating use of this pathway.

1.6.9. Increased shading and changes in surface water flow, 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.

The arrangement of the arrays across site will result in increased shading of large tracts of land while drip and flow regimen will alter. As a consequence, surface water availability on site will change, altering plant-water relations (Figure 23). In addition, the exclusion of both livestock and other herbivores may result in medium to long term changes in habitat form and structure. The following impacts are forecast:

Figure 23. Image indicating rilling and plant invasion in rill under PV module. Habitat form and structure will change on site as a consequence of the establishment of PV modules

Direct Impacts

- Minor changes in habitat composition, as certain species are ousted and others favoured as a consequence of the change in improved plant-water relations.
- Increased verdant growth in some species lying below the arrays.
- Reduced herbivory may give rise to changes in plant composition and structure on site.

Indirect Impacts

- With herbivory reduced and improved plant-water relations within large areas of the park, the area may act as a natural propagule repository for certain plant species, particularly those normally subject to grazing by livestock.

Cumulative Impacts

- As a number of PV projects will span a significant portion of contiguous land, and if all impacts are similar across these sites, then it may be expected that the above changes in habitat will encompass a significant portion of the surrounding environment.

- A large scale seed repository, free from intensive grazing pressures will be established within the region.

The status of the direct impact is rated as neutral with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

The status of the indirect impact is rated as negative with a local spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a site spatial extent and medium-term duration (i.e. the impact and risk will be experienced for 1-10 years). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as low.

Significance of impact without mitigation (Direct and Indirect Impacts): Very Low

Significance of impact without mitigation (Cumulative Impact): Low

Mitigation

1. None identified.

Significance of impact with mitigation (Direct and Indirect Impacts): Very Low

Significance of impact with mitigation (Cumulative Impact): Low

1.6.10. Changes in meteorological factors at a local scale, on account of the proposed PV array are likely to arise (e.g. subtle changes in wind dynamics, “heat bubble phenomenon” as well as the alteration in run off of surface water and evapotranspiration states), leading to long term, but generally latent changes in habitat.

Direct Impacts:

- The abovementioned “heat bubble” may alter behavioural patterns in some avian species, particularly raptors and larger species that utilize thermals. The consequence of such changes are however unknown.

Indirect Impacts:

- Subtle behavioural change in species within the region as certain species seek to benefit from aspects such as "heat bubble" phenomenon or change in surface water flow regime.

Cumulative Impacts:

- Increasing numbers of PV facilities may serve to make such behavioural / ecological changes more pervasive across the region.

The status of the direct impact is rated as neutral with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

Significance of impact without mitigation **Very Low**

Mitigation measures

None identified.

Significance of impact with mitigation **Very Low**

1.6.11 Potential abstraction of groundwater for the cleaning of modules, as well as operational use, will alter the state of subsurface water resources, depending upon nature and origin of such water.

It is doubtful if the requisite amount of water required for the cleaning of the PV panels is available on site; however the following impacts are forecast. Should groundwater be selected as the source of water for panel cleaning, the impact of the proposed project on groundwater and the geohydrology will be assessed as part of a separate specialist study.

Direct Impacts

- Increased demand on local aquifers will serve to reduce water availability, if such aquifers are located close to the surface. Such draw down of the aquifer may alter the plant-water relations of larger specimens that rely on such resource e.g. *A. erioloba*.

Indirect Impacts

- Abstraction of water from subsurface resources at the rate required may have consequences for areas beyond the site perimeter, depending upon the extent of the aquifer under consideration. Depletion of the aquifer may affect habitat forms at lower points within the catchment.

Cumulative Impacts

- As a number of PV facilities will be in operation in and around the identified aquifers, continued and regular abstraction of water by a number of users from the same aquifer(s) may affect water resources downstream of site, as well as the availability of water to other sites.

The status of the direct impact is rated as negative with a local spatial extent and very short-term duration (i.e. the impact and risk will be instantaneous). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are both rated as moderate. The significance of the direct impact without mitigation is rated as very low.

The status of the indirect impact is rated as negative with a local spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact are respectively rated as substantial and likely. The reversibility and irreplaceability of the impact are both rated as moderate. The significance of the indirect impact without mitigation is rated as moderate.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as severe and likely. The reversibility and irreplaceability of the impact are respectively rated as moderate and low. The significance of the cumulative impact without mitigation is rated as high.

Significance of impact without mitigation (Direct Impacts): Very Low
Significance of impact without mitigation (Indirect Impacts): Moderate
Significance of impact without mitigation (Cumulative Impact): High

Mitigation

1. Preferential use of recycled water arising from sewerage treatment facilities for operational phase requirements (instead of groundwater) where this may be available.

2. The prudent use of surface water resources where management and monitoring are more achievable than subsurface resources.

3. Adopt "dry" cleaning methods, such as dusting and sweeping the site before washing down.

4. Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol on site.

5. Low level and ongoing cleaning of the PV panels over time to reduce demand on aquifers i.e. cleaning is undertaken throughout the year rather than at singular intervals at select times of the year.

Significance of impact with mitigation (Direct Impacts): Very Low
Significance of impact with mitigation (Indirect Impacts): Low
Significance of impact with mitigation (Cumulative Impact): Moderate

1.6.13. The fencing of the site, possibly with electric fencing, is likely to impact upon faunal behaviour, leading to the exclusion of certain species and possible mortalities (Figure 24). Alternatively, such changes may also favour some specific individuals, particularly those that remain within the confines of the PV facility, which is likely to lead to further localised alteration of habitat and ecological process within the proposed PV facility.

Figure 24: Night Jar (*Caprimulgus rufigena*) electrocuted on energised electric fence.

Direct Impacts:

- As indicated above, the introduction of infrastructure into the area will change faunal behaviour. Electric fencing, the preferred method of securing PV facilities can have significant negative consequences for in particular, tortoise, small passerine birds and reptiles such as snakes. These species, if coming into contact with the charged wires of the fence can be severely maimed or killed. Tortoises, if moving up to an electric fence are unable to move away from the fence if they are unable to extend their head and neck. As a consequence, tortoises are particularly susceptible to death through starvation if encountering an electric fence with a positive wire in or around ground level.

Indirect Impacts:

None identified

Cumulative Impacts:

- 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.

The status of the direct impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

Significance of impact without mitigation **Low**

Mitigation

1. Ensure that the live electrical fence wire is not placed at ground level.

2. Conduct regular inspections of the fence line to address any animals that may be affected by the electric fence (i.e. tortoise).

Significance of impact with mitigation **Very Low**

<u>Decommissioning Phase</u>

The decommissioning phase is expected to see a reversion to an agricultural land use akin to the present state or alternatively some other agricultural activities. As such the structures on site will be removed, in particular the photovoltaic arrays.

1.6.14. A reversion to the present seral stage, where continued grazing by livestock and herbivory by game will arise.

During the decommissioning phase, the potential impact of reverting to the present seral stage has been identified.

The spatial extent of this impact is site specific with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are both rated as low. The significance of the impact without mitigation is rated as low.

Significance of impact without mitigation **Low**

No mitigation measures have been identified.

1.6.15 The reversion of present faunal population states within the study area to a previous state.

With the removal of infrastructure from site, areas of exclusion as well as anthropogenic influences on population states and presence within the site will alter accordingly. Such alteration will see species excluded from the area under a PV facility (larger mammals in particular), access areas from which they were previously excluded. Habitat change on site will influence population trends and traits within the area.

The spatial extent of this impact is site specific with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the impact without mitigation is rated as low.

Significance without mitigation **Low**

No mitigation measures have been identified

1.6.16 Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment;

As infrastructure is removed from site, surface hydraulics will change in site. Habitat changes associated with the reversion to an agricultural land use will see concomitant changes in the geomorphological state of both major and minor drainage lines, resulting from an equilibria shift.

The spatial extent of this impact is local with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the impact without mitigation is rated as low.

Significance of impact without mitigation **Low**

No mitigation measures have been identified

1.6.17 Exotic weed invasion as a consequence of the abandonment of site and cessation of weed control measures

Exotic weed invasion is a likely consequence following the cessation of the PV facility operations. Decommissioning of site will see increased disturbance of the land and therefore increased susceptibility to exotic weed invasion.

The spatial extent of this impact is local-regional with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the impact without mitigation is rated as medium.

Significance without mitigation **Moderate**

Mitigation

Mitigation would include monitoring of the land and redress of exotic weeds found present on site. In addition, the stabilisation of disturbed lands immediately after the clearance of the land of the PV arrays and related infrastructure would serve to moderate the potential for invasion.

Significance with mitigation **Low**

1.7. IMPACT ASSESSMENT SUMMARY

Table 6-1 Direct impacts 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	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

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	Moderate	Likely	High	Low	Alternative water resources to be utilized	Very low	Very Low	5	Medium

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 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

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

Table 6-2 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	1.Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible). 2.Avoidance of significance sculpting of land and maintenance of the general topography of the site.	Low	Very low	5	High

									3 Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features. 4. Maintenance of a high level of housekeeping on site during the construction phase. 5. 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.				

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
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. 2. 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

Table 6-3 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
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
Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour.	Change in animal behaviour	Negative	Local	Long term	Slight	Unlikely	High	Low	None identified	Very low	Not applicable	5	Medium

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

Table 6-4 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

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

Table 6-5 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

Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Change in drainage patterns and drainage features	Negative	Regional	Long-Term	Substantial	Likely	Low	Moderate	Exclusion of major drainage lines from development Avoid sculpting of land Surface flow energy dissipaters 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.	Moderate	Low	4	High

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). 2.Avoidance of significance sculpting of land and maintenance of the general topography of the site including the avoidance of major drainage lines. 3.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	Very 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

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

Table 6-6 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
Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour	Changes in fauna 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	Slight	Likely	High	Low	Management of potential sources of electrocution – electric fences	Low	Very low	5	High

Table 6-7 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 abandonmen of site and cessation of weed control measures	Habitat change	Negative	Local - Regional	Long term	Moderate	Very likely	High	Low	Weed control and land management	Moderate	Low	4	High

Table 6-8 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
Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour	Changes in fauna 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	Slight	Likely	High	Low	Management of potential sources of electrocution – electric fences	Low	Very low	5	High

Table 6-9 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: Without Mitigation/ Management	Significance of Impact and Risk: With Mitigation/ Management (Residual Impact/ Risk)	Ranking of Residual Impact/ Risk	Confidence Level
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 abandonmen of site and cessation of weed control measures	Habitat change	Negative	Local - Regional	Long term	Moderate	Very likely	High	Low	Weed control and land management	Moderate	Low	4	High

1.8. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Utilising the above information the following broad issues are considered within the Environmental Management Programme that would be associated with the proposed development.

Pre-Construction:

- Identification of development exclusion area and buffer around southern drainage line feature.
- Pre-construction evaluation and possible plant rescue operations;
- Identification of intrusion of the proposed construction site and development footprint, into minor drainage lines (if any);
- Identification of laydown areas, roadways etc. on site and evaluation of affected points within site, particularly in respect of floral and faunal presence; and
- Permitting requirements in terms of the National Water Act and Northern Cape Conservation Act.

Construction Phase:

- Site induction and interaction within management on ecological aspects;
- Site inspection of any fauna within the construction area during post fencing completion;
- Monitoring of operations, including species presence within site, mortalities and sitings;
- Maintenance of vegetation and avoidance of unnecessary clearance of site;
- Exotic weed management; and
- Erosion control measures to be implemented where applicable.

Post Construction Phase:

- Monitoring of faunal activities within the fenced area of the site and immediate proximity of site;
- Management of faunal intrusion through the fencing, including possible mortalities;
- Consideration of lighting regime around the site and the impact of ELP.
- Vegetation management on site – consideration of redress methods of growth and habitat form around site;
- Exotic weed management; and
- Erosion control measures.

1.9. CONCLUSION AND RECOMMENDATIONS

The ecological evaluation of the Skeerhok PV 2 site included a review of the entire property on the relevant portion of the Farm Smutshoek 395 which lies within the proposed Skeerhok PV complex. Such evaluation included consideration of the bio physical state of natural drainage features, topographical features and a holistic review of all components within the ecological landscape. The evaluation of the results of desktop and field reconnaissance identified and served to develop a plan for the exclusion of particular areas from any proposed development of a PV facility. Included in the assessment was consideration of terrestrial and hydrological systems, as well as fauna (including avi-fauna). Major impacts identified as a consequence of the development proceeding relate to, *inter alia*;

- Changes in the broader habitat as a consequence of variation in physical factors within the site (e.g. shading of vegetation, changes in surface water flow regime);

- Changes in the broader surface and possibly sub surface hydrology; and
- The ousting, and in some cases recruitment of species, with subsequent variation in populations in and around the development.

The ecological evaluation has determined that there is some eco morphological and hydrological merit or benefit in maintaining a minor drainage located to the south of the site and associated with the Rugsrivier (Hartbeesriver) catchment, free of further transformation. A buffer of 32m has been proposed to be established around this drainage feature, which is considered to be an arbitrary but applicable set back, that will allow the morphology of the feature to respond to changes within the upper catchment arising from the proposed development. There will be minor to moderate changes evident in the terrestrial environment resulting from the establishment and operation of the PV facility, which in turn will be manifest in changes in faunal components of the environment.

None of the above impacts have been identified as being of high significance (with the implementation of mitigation measures) and most impacts arising; can be considered to be of low to very low significance in a holistic evaluation.

Given the above information, it is evident that with the judicious placement of the proposed solar PV facility within the boundaries of the study area, this development cannot be precluded from the Skeerhok land complex, which is presently under consideration for the establishment of PV facilities. As such, authorisation may be granted for the development of the site as a PV generation facility. Judicious management of the site should however include:

- Application and maintenance of the recommended set back around the drainage line identified.
- Avoidance of the excessive clearance of vegetation within the site;
- Management of exotic weed invasion that may arise;
- 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.

The above, along with the various mitigation measures espoused in this report should be incorporated as conditions, into any authorisation granted by the relevant authority.

It is our opinion that with the implementation of the above, the project proposal, subject to final design and adherence to the above recommendations, can be accommodated on site and should therefore be authorised.

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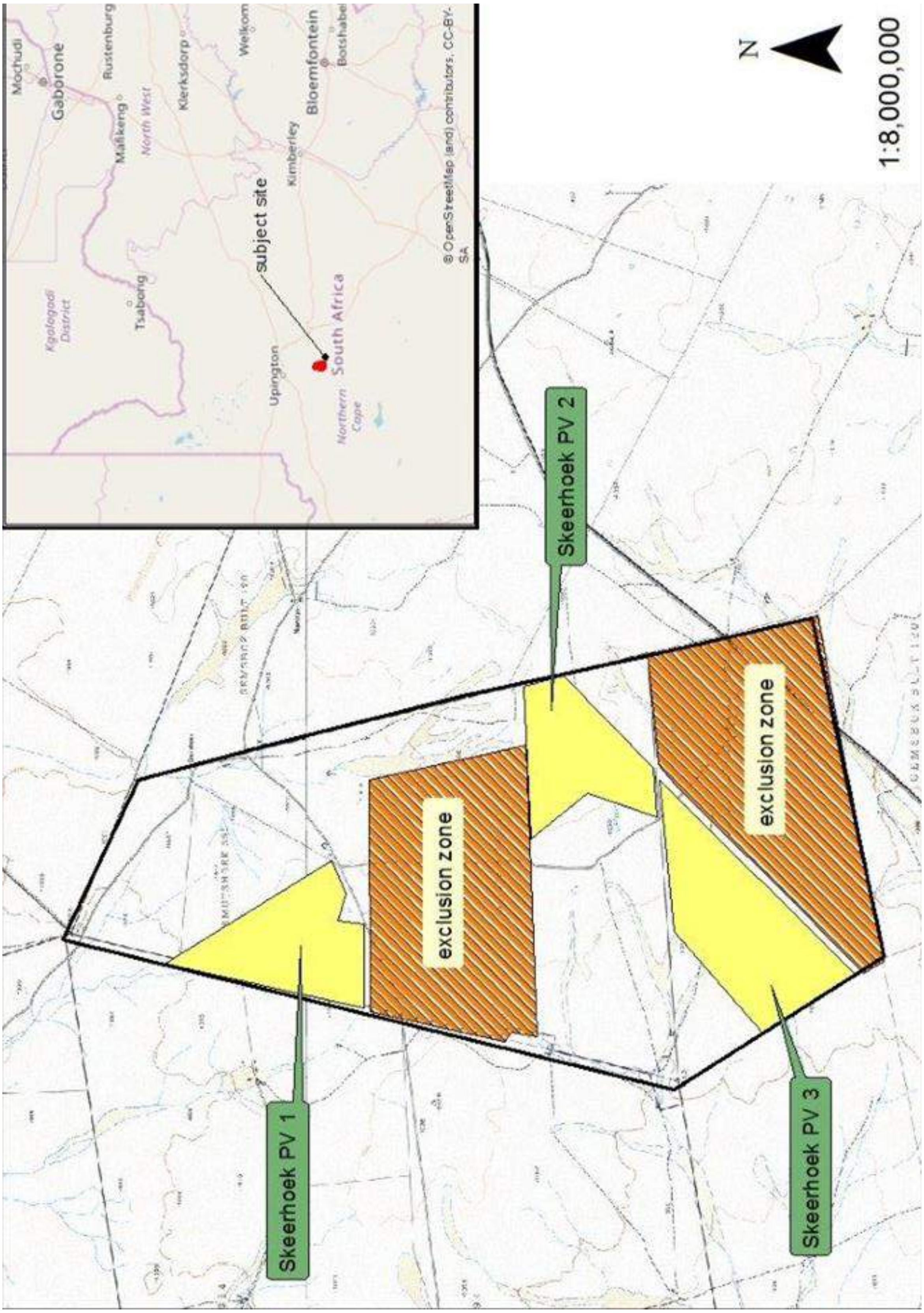
1.11. APPENDICES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Skeerhoek PV 2
Skeerhoek PV 3
exclusion zone
exclusion zone
subject site
Mochudi
Gaborone
Rustenburg
Mafikeng
North West
Klerksdorp
Welkom
Kimberley
Bloemfontein
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Tsabong
Upington
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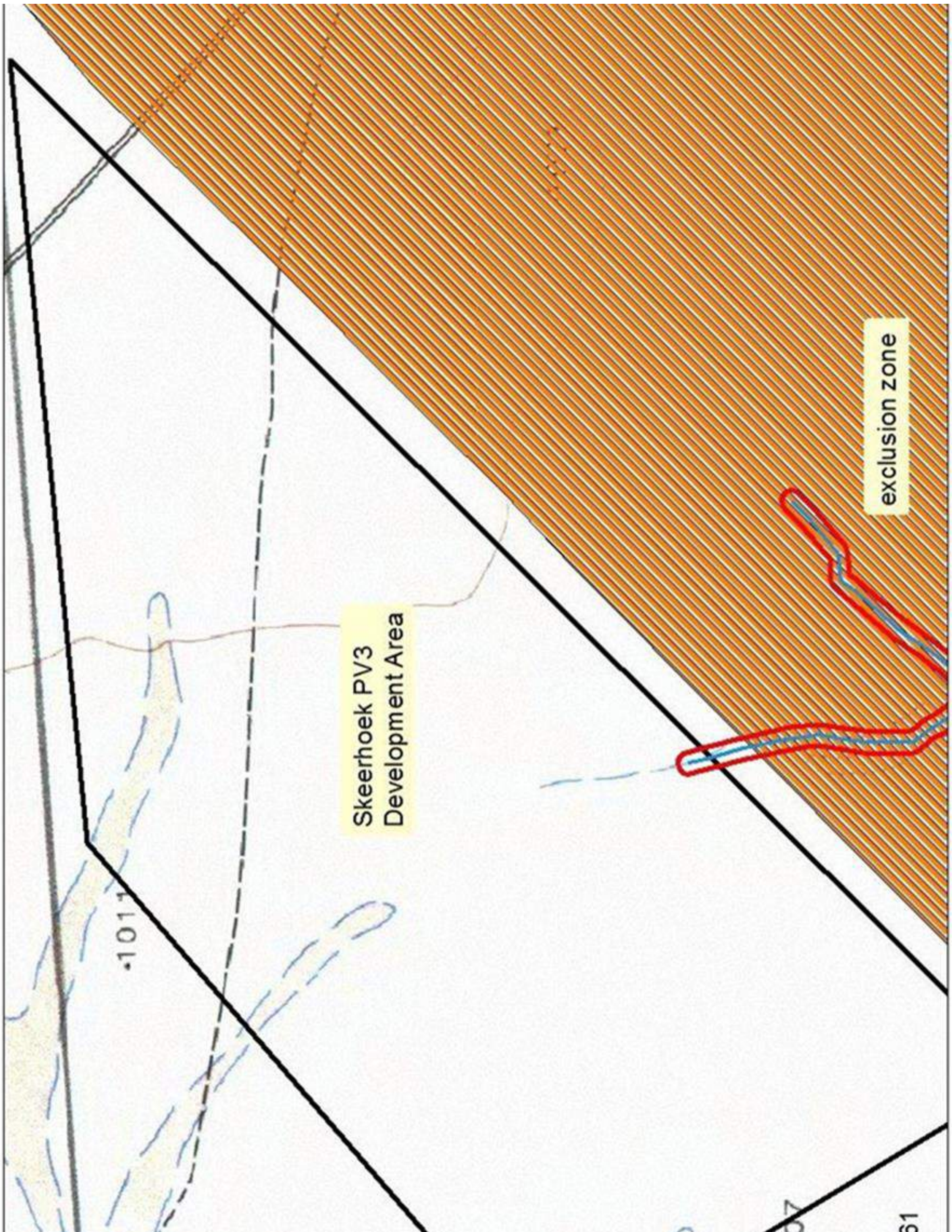
Skeerhoek PV3
Development Area
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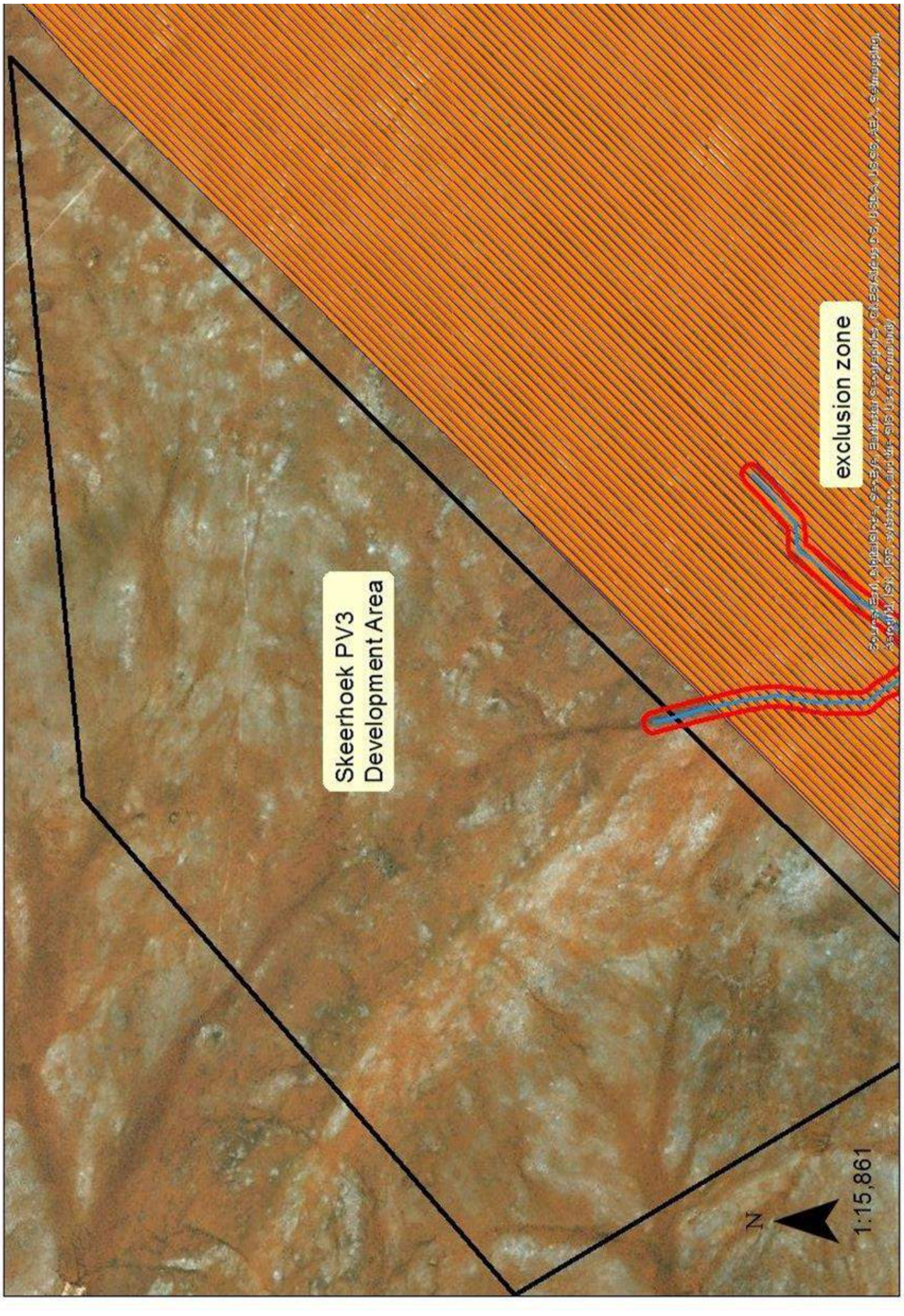
Skeerhoek PV3
Development Area
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DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX J:

Avifauna Report

SKEERHOK PV2 SOLAR PHOTOVOLTAIC FACILITY

AVIFAUNAL IMPACT ASSESSMENT

EIA PHASE

February 2018

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EXECUTIVE SUMMARY

This report evaluates the likely impact on birds of a proposed solar photovoltaic energy facility near Kenhardt in the Northern Cape. The facility is named Skeerhok PV 2 and consists of a 100MWac solar array and associated infrastructure.

This arid area is home to several large terrestrial bird and raptor species, the most important of which are Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori*, Secretarybird *Sagittarius serpentarius*, Karoo Korhaan *Eupodotis vigorsii,* Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus*. In addition to being classified as threatened regionally and in some cases globally, most of these species are facing significant threats to their survival from existing impacts in the arid parts of South Africa. In addition, this area is home to an assemblage of arid zone adapted smaller bird species including larks, sparrow-larks, chats and others. Most important of these from a conservation perspective are Red Lark *Calendulauda burra* and Sclater's Lark *Spizocorys sclateri*, both of which are listed as regionally threatened species (Vulnerable and Near-threatened respectively), have very restricted ranges and have been recorded in the broader area within which the study area is situated. Stark's Lark *Spizocorys starki* is also an important endemic present in the area, and Burchell's Courser *Cursorius rufus* (Vulnerable) is a nomadic species which occurs in the broader area.

NOTE: For the purposes of this study we conducted **2 specialist site visits and 3 seasons** of on-site bird monitoring, in accordance with the best practice guidelines (Jenkins *et al,* 2017). The proposed project falls under **Regime 2** on account of being of 'medium' avifaunal sensitivity and greater than 150ha in extent. This means it requires 2 to 3 site visits of 3 to 5 days duration each over 6 months. We conducted 3 x 4 day site visits thereby ***slightly exceeding the minimum requirements*** in our view. We made the following findings with respect to avifauna:

- Our surveys on site took place in a slightly above average rainfall year (165.0mm in 2017 c.f. 147.8mm p.a. mean since 1960). This means that our data should be representative of typical conditions on site.
- The proposed Skeerhok site is already relatively impacted by linear infrastructure including roads, railway line, and transmission and distribution power lines.
- There are no Important Bird & Biodiversity Areas close to the proposed site.
- Walked transects on site recorded 29 small passerine bird species in total. Twenty of these species are either endemic or near endemic to southern Africa, which is a very high level of endemism. Whilst the most abundant species on site were all common species, and important endemic, Stark's Lark *Spizocorys starki* was also recorded in relatively high abundance on site. No regionally Red Listed species were recorded on site by this method.
- Driven transects on site recorded 6 priority species. Two were small passerines, Red Lark *Certhilauda burra* (Vulnerable -1 individual), and Double-banded Courser *Rhinoptilus*

africanus. The 4 remaining species were: Kori Bustard *Ardeotis kori* (Near-threatened), Ludwig's Bustard *Neotis ludwigii* (Endangered), and Northern Black Korhaan *Afrotis afraoides*. Three of these species are regionally Red Listed (Taylor *et al,* 2015) as indicated above.

- Martial Eagle *Polemaetus bellicosus* (Endangered) was recorded several times off site, approximately 9km to the west. Although these birds are suspected to breed somewhere in that area (We did not locate a nest) this is too far from the proposed site to be of concern.
- A total of 57 bird species were recorded on site during our monitoring programme by all methods and incidentally. Thirty of these are endemic or near-endemic. This included 5 regionally Red Listed species, the 4 mentioned above already and Karoo Korhaan *Eupodotis vigorsii* (Near-threatened). Sclater's Lark *Spizocorys sclateri* and Burchell's Courser *Cursorius rufus* were not recorded on site during this programme, but are considered likely to visit the site occasionally when conditions are right.
- Considering the bird and habitat data collected on site we conclude that the following species will be most at risk if the proposed development goes ahead: Ludwig's Bustard; Kori Bustard; Karoo Korhaan; Red Lark; Sclater's Lark; and Stark's Lark. There are many more endemic but not Red Listed species which will also be of concern, but we feel the above suite of species serves as a good surrogate for those more common species in terms of impact assessment and management.

Our preliminary assessment of the significance of the impacts on avifauna on site is as follows:

- Habitat destruction during the construction phase will be of HIGH significance, mitigated to MODERATE significance.
- Disturbance of birds during the construction phase will be of LOW significance.
- Bird fatalities at the facility during the operational phase (mostly through collision with infrastructure) will be of MODERATE significance, mitigated to LOW.
- Nesting of birds on the facility infrastructure during the operational phase will be of LOW significance.
- Altered surface water runoff on site during the operational phase will be of LOW significance.
- Chemical pollution due to panel cleaning during the operational phase will be of LOW significance.
- Disturbance of birds during the construction phase will be of LOW significance.

Mitigation for inclusion in the EMPr

The following mitigation measures are recommended:

- Water courses, drainage lines, streams and wetlands should be avoided and a no go buffer of 100m be applied around them.
- Dams and livestock water points should likewise be avoided with a 100m no go buffer.
- Rocky outcrops should be avoided with a 100m no go buffer.
- All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.
- Care should be taken not to introduce or propagate alien plant species/weeds during construction.
- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.
- Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.
- The PV panels should spend as little time as possible time in a vertical position since this presents a greater collision hazard. It is not clear at this stage whether the panels will be able to tilt or be fixed.
- In accordance with best practice guidelines (Jenkins *et al,* 2017), we recommend that post construction bird monitoring is done once the facility is operational. Very little is known about the impacts of solar facilities on birds in South Africa. For this reason an extensive post construction monitoring programme is recommended for this site in order to document any impacts and provide the basis for an adaptive management approach to any impacts.
- Mitigation is complex at electrical structures since there are many ways in which birds could get electrocuted as the hardware is complex and provides many different potential perches for birds. It is therefore recommended that mitigation be applied reactively once the facility is operational, only if a significant problem is detected. Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.
- We recommend that the operational phase EMP include provision for application to the provincial authority for permits for any necessary nest management.
- A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals.

Environmental impact statement

The Skeerhok PV 2 site is important habitat for an assemblage of arid zone bird species, many of which are endemic. The transformation of natural habitat for the proposed facility will therefore be of high significance. Fortunately the facility will transform a small area relative to the remaining habitat, which is fairly uniform in the broader area. The impact of habitat destruction can be mitigated to moderate significance by ensuring that the more sensitive micro habitats are designated as no go areas. All other impacts are of moderate or low significance. We recommend that the facility be authorised, provided that the recommendations of this report are implemented.

Cumulative impact statement

The proposed facility will result in the removal of natural vegetation and the transformation from a natural landscape to a totally transformed industrial type land use. This will render that area almost totally unavailable as habitat for birds. It stands to reason that the more land is transformed in this way the greater the impact on birds. The cumulative impact of multiple solar energy facilities on birds is therefore negative. Given that we have judged the impact of this proposed Skeerhok PV 2 facility to be of HIGH significance for avifauna (mitigated to MODERATE), the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative.

This cumulative impact assessment assumes the worst case scenario of up to 14 solar facilities being constructed in this 20km radius. However, if as per the DEA statement, only 6 are built, this would reduce the significance of the impacts by approximately half. This would result in the significance being rated as MODERATE rather than the current HIGH.

Contents

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

SKEERHOK PV 2 – SOLAR ENERGY FACILITY

Specialist:	WILDSKIES ECOLOGICAL SERVICES		
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Telephone:	0218882432	Fax:	
E-mail:	KSTROEBEL@CSIR.CO.ZA		

4.2 The specialist appointed in terms of the Regulations_

I, J SMALLIE, declare that -- General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

WILDSKIES ECOLOGICAL SERVICES
Name of company (if applicable):

29 JANUARY 2018
Date:

Requirements of Appendix 6 – GN R326 of NEMA EIA Regulations as amended (7 April 2017)	**Where addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Pages 5-6, Appendix 4
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Pages 5-6
c) an indication of the scope of, and the purpose for which, the report was prepared; (ca) an indication of the quality and age of base data used for the specialist report; (cb) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Page 9-10 Page 24-25 Page 39-46
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Page 25-26
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Pages 25-26
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	Page 47
g) an identification of any areas to be avoided, including buffers;	Page 47
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Page 47
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Page 26-27
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Page 39
k) any mitigation measures for inclusion in the EMPr;	Page 39
l) any conditions for inclusion in the environmental authorisation;	Page 39
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Page 48
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (ia) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Page 48
o) a description of any consultation process that was undertaken during the course of	Page 24

preparing the specialist report;	
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Page 24
q) any other information requested by the competent authority.	Page 24
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

1. INTRODUCTION

1.1 Background to the current study

juwi Renewable Energies (juwi) plans to develop a new solar photovoltaic energy facility to the north-east of Kenhardt in the Northern Cape, called Skeerhok PV 2. WildSkies Ecological Services (Pty) Ltd has previously provided juwi with initial advice on the risk to avifauna at this site (see Smallie, 2017), and has conducted pre-construction bird monitoring on site under contract to juwi. Juwi has contracted the CSIR to conduct the necessary environmental impact assessment for the proposed facility and WildSkies to conduct the avifaunal impact assessment. This report is the EIA avifaunal impact assessment.

The specialist conducted site visits in May 2017 and January 2018. The 3 seasons of pre-construction bird monitoring (4 days on site each) were conducted during July and November 2017, and January 2018.

1.2 Terms of reference

The typical terms of reference for a study of this nature are as follows:

- Provide status of bird habitats and identification of all ecologically sensitive areas
- Identification of endangered species and their locations
- Identify conservation worthy areas and how the proposed development can avoid them;
- Identify potential impacts and mitigation measures of the proposed infrastructure on the avifauna
- Classification of each impact according to methods as outlined by the client (see Appendix 1)
- Recommendation of the best management measures to mitigate any risk.
- Identification of any monitoring required during operational phase.

1.3. Description of the proposed development

A summary of the key components of the proposed project is described below (supplied by CSIR). It is 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).

The project is being developed with a maximum possible installed capacity of 114 MWdc which produces 100 MWac of electricity. Once commercial operation date is achieved, the proposed facility will generate electricity for a minimum period of 20 years. The property on which the SEF is to be constructed will be leased by the project owner from the property owners for the life span of the project. The assessed area includes approximately 400 ha of land in total. Due to the fact that the solar PV facility requires approximately 300 ha of land, there is spatial scope to avoid major environmental constraints through optimisation of the final design of the solar facility. Figure 1 indicates a layout of these project areas in relation to Skeerhok PV 2.

The larger 400 ha buildable area was considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities can be avoided in the final siting and location of the proposed facility. Based on the findings of the specialist studies, an environmental sensitivity map has been produced (and included in Chapter 7 of the EIA Report). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 400 ha site that was assessed. Based on this map, the preferred location for the 300 ha Skeerhok PV 2 facility, also known as the Development Envelope, avoids (where possible) the sensitive features that were identified by the specialists within the original 400 ha assessed area. Based on the boundaries of the Development Envelope and the constraints of the environmental sensitivities, a site layout has also been preliminarily determined for this project (as discussed in Chapter 7 of the EIA Report).

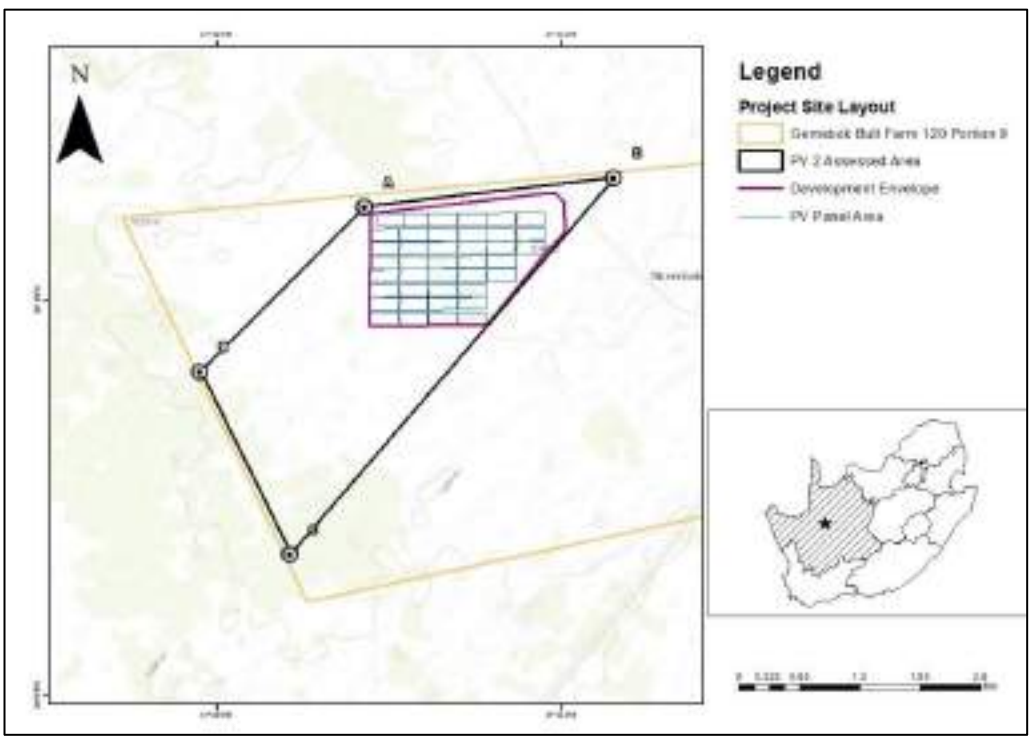

Figure 1. The position and layout of the proposed Skeerhok PV 2 facility.

It should be noted that even though a site layout has been provided (as shown in Figure 1), should the layout change following the issuing of the EA (should it be granted), that any alternative layout occurring within the boundaries of the Development Envelope would not change the scope of work or the findings of the impact assessments undertaken during this EIA. The Development Envelope is considered to be a “box” in which the proposed project components discussed within this chapter can be constructed at whichever location (within the boundaries of the assessed Development Envelope) without requiring an additional assessment or change in impact significance. Any changes to the layout are therefore considered to be non-substantive. This is discussed further in Chapter 7 of the EIA Report. It should be noted that a similar approach has been followed for the electrical infrastructure and transmission lines, which has been assessed as part of a separate Basic Assessment Processes. To this end, an electrical infrastructure corridor has been proposed for proposed transmission lines.

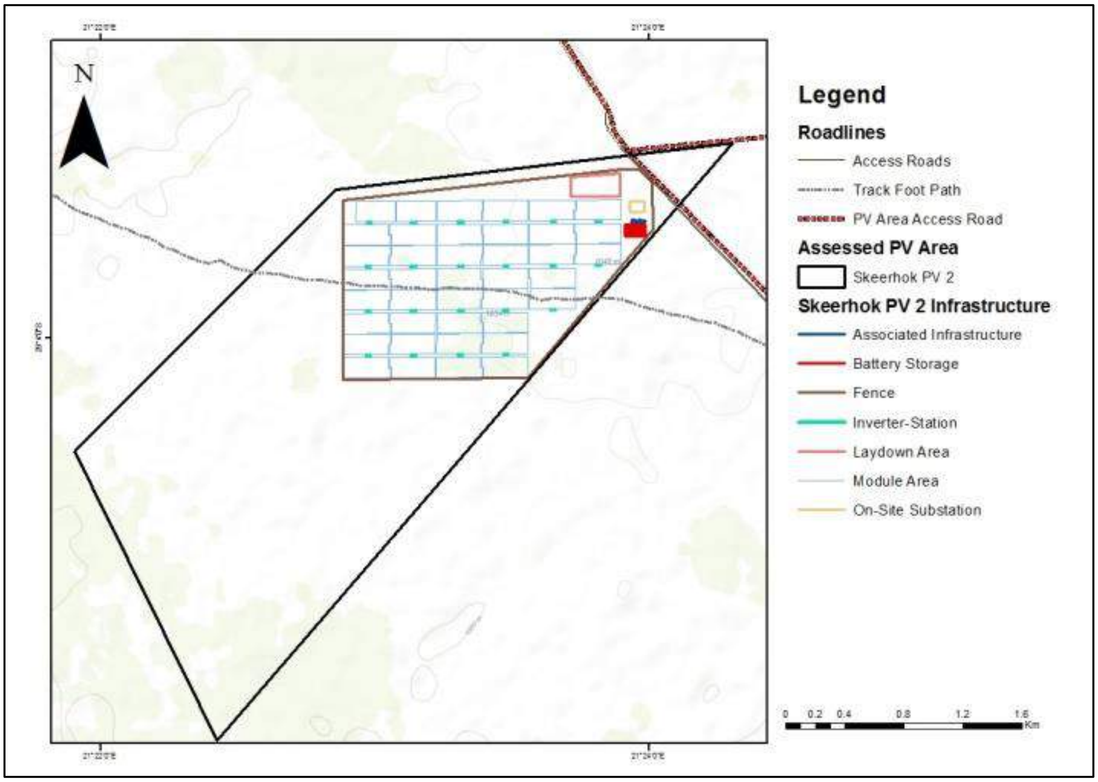

Figure 2. Proposed layout of the Skeerhok PV 2 facility.

The total area of Portion 9 of Gemsbok Bult Farm 120395, where the proposed SEF will be constructed, is approximately 2,000 ha, while the development area (area under consideration for this assessment) of the SEF is approximately 300 ha, accounting for 15 % of the total area of the farm.

The two main components of the project will consist of the solar field (solar panels and building infrastructure) and the associated infrastructure. The technical components forming part of the Solar Facility are discussed in detail below.

Table 1. Summary of technical details for the proposed facility

Component	Description / dimensions

Height of PV panels	Approximately 5 m high
Area of PV Array	≤250 hectares
Number of inverters required	To be determined at detailed design phase based on the invertor sizes available at the time of construction.
Area occupied by inverter/ transformer stations/ substations	To be determined at detailed design phase based on the sizes of the invertor and transformer stations available at the time of construction. This area is however incorporated into the PV array area of ≤250 hectares as indicated above.
Capacity of on-site substation	22/33 kV to 132 kV
Area occupied by both permanent and construction laydown areas	≤1 ha
Area occupied by buildings	≤1 ha area for site office, and Operations and Maintenance (O&M) buildings.
Length of internal roads	≤ 15 km
Width of internal roads	≤ 8 m
Proximity to grid connection	Approximately 30 km
Height of fencing	3 m high
Type of fencing	To be determined at construction phase based on the outcomes of the EPC procurement process.

The 100MWac Solar Facility on Portion 0 of Smutshoek Farm 395 will consist of the following components:

Solar Field:

- ≤250 ha of photovoltaic (PV) modules mounted on free field single-axis trackers or fixed tilt PV solar module mounting structures comprised of galvanised steel and aluminium; and below ground electrical cables connecting the PV arrays to the inverter stations, O&M building and collector substation; and
- Ring main units; and
- Inverters and mini-subs.

Collector substation:

- ≤1 ha 22/33 kV to 132 kV collector substation to receive, convert and step up electricity from the PV facility to the 132 kV grid suitable supply. The facility will house control rooms and grid control yards for both Eskom and the Independent Power Producer. A 32 m telecommunications tower (lattice or monopole type) will be established in the substation area;

O&M area:

- Operations and Maintenance (O&M) buildings;
- ≤1 ha O&M laydown area (near / adjacent substation);
- ≤0.01 ha solar measuring station;

- Parking, reception area, offices, guest accommodations and ablution facilities for operational staff, security and visitors;
- Workshops, storage areas for materials and spare parts;
- Water storage tanks or lined ponds (~160 kl/day during first 3 months; ~90 kl/day for 21 months during rest of construction period; ~20 kl/day during operation);
- Septic tanks and sewer lines to service ablution facilities; and
- Central Waste collection and storage area.

Battery Storage System:

- 100 MWh Battery Storage Facility with a maximum height of 8m and associated operational, safety and control infrastructure;

Access road:

- ≤ 15 km long, ≤ 8 m wide gravel access road running from the Transnet Service Road to the site

Service roads:

- ≤10 km of ≤ 8 m wide gravel internal service roads within the plant boundary;

Other infrastructure:

- Perimeter fencing and internal security fencing and gates as required.
- Access control gate and guard house on access road;
- ≤3.5 km length of water supply pipeline connecting existing boreholes to storage, alternatively water will supplied by the local municipality.
- Stormwater drainage

Construction site office area (used during construction and rehabilitated thereafter):

- ≤1 ha site office area;
- ≤ 10 ha laydown area; and
- ≤1 ha concrete batching plant

The Skeerhok PV 2 project will connect to the Eskom Nieuwehoop Substation located on Portion 3 of Gemsbok Bult Farm 120 via a 132 kV overhead transmission line (the development of the 132 kV line will be considered under a separate Basic Assessment process).

1.4. Background to bird interactions with solar PV facilities

Photovoltaic (PV) technology uses cells to convert sunlight into electric current. Commercial scale facilities typically consist of the following components: PV modules; Inverters and power electronics; structural and wiring hardware; roads; fences; substations; and office buildings.

Note that there are also typically impacts associated with the grid connection power lines. In this case the power line will be the subject of a separate Basic Assessment and is not discussed further in this report.

1.4.1 Habitat destruction

Due primarily to the surface area required for the PV modules or panels (typically approximately 2-5hectares per MW – Ong *et al*, 2013; Hernandez *et al,* 2014 or 1.4 to 6.2 ha/MW according to US Department of Energy 2012) or in the case of Skeerhok PV 2 approximately 300ha in total (project description), and the associated roads, substations, offices etc, solar PV facilities occupy a relatively large amount of land and therefore represent a large human land use in the environment (Walston *et al*, 2015). Lovich and Ennen (2011) and DeVault *et al* (2014) state that in 'many' cases vegetation removal is complete at PV facilities. Our own observations of operational PV facilities in South Africa to date confirm that vegetation removal is complete in all cases. Vegetation removal translates into habitat removal or destruction for bird species. Habitat removal is a consequence of almost any new form of development, and is not particularly unique to solar PV energy. The significance of the habitat removal depends on factors such as: the amount of habitat affected; the uniqueness of the habitat; and the sensitivity and conservation status of the bird species utilizing that habitat.

1.4.2. Disturbance of birds & displacement effects

Construction of a facility of this nature requires a significant amount of machinery and labour to be present on site for a period of time (approximately 12 -24 months for Skeerhok PV 2 – project description). For the more shy and sensitive bird species this could disturb them and displace them from the area at least for the duration of construction and possibly longer. In addition, species commuting around the area may avoid the site once operational and fly longer distances than usual as a result. For some species this may have critical energy implications. Disturbance of breeding birds is of particular concern since this could result in lower breeding productivity, total breeding failure, and/or temporary or permanent abandonment of the breeding site. All of these can have significant consequences for threatened bird species.

1.4.3. Bird fatality at PV facilities

Until recently very little information on bird fatality at PV facilities around the world was available. As a result there was relatively low concern for this impact amongst ornithologists, certainly when compared to wind energy facilities for example. However, in the last 3-4 years some data has emerged which points towards the direct fatality impacts at PV facilities possibly being far greater than previously understood (Kagan *et al,* 2014; Walston *et al*, 2015). Bird fatalities have been recorded in high numbers at at-least one site in the USA (Kagan *et al,* 2014; Walston *et al*, 2015; Walston *et al*, 2016).

Walston *et al* (2016) reviewed bird fatality information at solar energy facilities across the USA (although finding that most information was available for a smaller area in California). They found that 3 facilities had systematically collected data on avian mortalities, one of which was a PV facility, the California Valley Solar Ranch project of 250MW. At this facility, a total mortality rate of 10.7 birds/MW/year was recorded, consisting of 0.5birds/MW/year from known fatality causes (attributable to the facility) and 10.2birds/MW/year of unknown causes.

It is important to understand that bird abundance and flight activity levels differ according to habitat availability, and other natural features. Therefore the impact on birds through direct fatality is very site specific. The risk can be greatly reduced if the location of the project takes the following features relating to bird habitat into account: migratory flyways; wetlands; riparian vegetation; and availability of habitat amongst the arrays. Avoiding siting the solar project infrastructure in these sensitive areas can greatly reduce the impact on birds (Walston *et al*, 2015).

In addition to the above information, much has been written about the potential to attract certain bird guilds to a solar energy facility (Kagan *et al,* 2014). Such attractants could include evaporative cooling ponds (if present) that provide artificial habitat to birds and their prey. Glare and polarized light could attract insects and in turn foraging bird species (Horvάth *et al*, 2009). The so called "lake effect" created by the reflective surfaces of the PV panels have been hypothesized to attract migrating waterfowl that then collide with the panels when they attempt to land (Kagan *et al*, 2014). To date no empirical research has been conducted on this "lake effect" (Walston *et al,* 2015) and it remains unproven.

Birds can also be killed through electrocution on electrical infrastructure such as substations and switching gear on site, and through entanglement in or collision with fences. Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). The larger bird species are most affected since they are most capable of bridging critical clearances on electrical hardware. Species likely to frequent these areas are typically the less sensitive, non-threatened species such as crows.

1.4.5. Nesting & other utilization of facility by birds

Various bird species are quick to seize a new opportunity for perching, roosting or nesting, including on man-made structures (van Rooyen & Ledger 1999, de Goede & Jenkins 2001). In this landscape this is particularly relevant as it is relatively devoid of tall trees. It is likely then that birds will use certain parts of the proposed facility once commissioned. A prime example in this Kenhardt area is the Sociable Weaver *Philetairus socius* which is quick to nest on any vertical infrastructure in this area. Whilst this nesting could be viewed as a positive impact for birds, it typically creates operational problems for the facility, which require management actions such as nest management in order to ensure that the nests don't interfere with operations or increase fire risk. Nest relocation or removal should be done under permit from the provincial authority.

It is also likely that some small species will use the PV panels for shade and this will create a new microhabitat on the site. This should not adversely affect the operation of the equipment however and should also not lead to direct mortalities by these small species.

1.4.6. Altered water runoff patterns

It is likely that altering the nature of the sites surface from natural vegetation to infrastructure, roads, gravel, and possible paving – will alter the way in which water moves on the site after rainfall and cleaning of infrastructure. If this is not carefully managed this could cause soil erosion and thereby alter more bird habitat than necessary by affecting off site areas. Increased runoff could also create moister conditions on or near the site thereby attracting more birds to the area and increasing the likelihood of other interactions with the facility.

1.4.7. Chemical pollution associated with PV panel cleaning

It has been suggested (Jenkins *et al,* 2017) that pollution could occur if hazardous chemicals are used to clean PV panels once operational. This could have secondary effects on vegetation, invertebrate populations and in turn food availability and habitat for birds.

1.4.8. Contextualising solar energy avifaunal impacts

Walston *et al* (2015) stated that it is important to compare solar energy bird fatalities with bird fatalities from other anthropogenic sources. Several authors have done this already including (Erickson *et al*. 2005, 2014; Loss *et al*. 2013; Smallwood 2013; Sovacool 2013). Whilst such contextualization is important, care needs to be taken when using this approach as not all bird species are equally exposed to all of the sources of fatality, and not all comparisons are valid. Drawing comparisons between for example common passerines colliding in high numbers with high rise buildings in cities, and rare Red List bird species colliding with a PV facility in a rural landscape is not reasonable. Small numbers of fatalities of threatened species can far outweigh (in conservation importance) far greater numbers of fatalities of common bird species. Comparisons with other 'rurally' located developments such as wind energy may be far more valid. Importantly, any mortality associated with a new proposed development such as the Skeerhok PV 2 project is added to the existing mortality from all other sources for the species, they do not replace any of the other sources of mortality. For certain bird species, especially Red Listed species it is of critical importance than any new sources of anthropogenic impacts are avoided as far as possible, precisely because the existing other impacts are so difficult to mitigate reactively. Impacts of other forms of development on bird species should be used for context but cannot be used as justification for creating new impacts on those species in our opinion.

1.5. Relevant legislation

Various sets of legislation and policy frameworks are relevant to this specialist study and development, including the following:

- The Convention on Biological Diversity is dedicated to promoting sustainable development. The Convention recognises that biological diversity is about more than plants, animals and micro-organisms and their ecosystems. It is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. It is an international convention signed by 150 leaders at the Rio 1992 Earth Summit, and South Africa is a signatory.
- An important principle encompassed by the CBD is the precautionary principle, which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used a reason for delaying management of these risks. The burden of proof that the impact will not occur lies with the proponent of the activity posing the threat.
- The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include 117 (as of 1 June 2012) Parties from Africa, Central and South America, Asia, Europe and Oceania. South Africa is a signatory.
- The African-Eurasian Waterbird Agreement: the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) is the largest of its kind developed so far under the CMS. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguins. The agreement covers 119 countries from Europe, parts of Asia and Canada, the Middle East and Africa.
- National Environmental Management – Biodiversity Act - Threatened or Protected Species list (TOPS): the following target species for this study are on the list: Kori Bustard, Ludwig’s Bustard, Black Stork, Martial Eagle (all Vulnerable).
- The Northern Cape Nature Conservation Act 9 of 2009 is relevant, and provides protection for most bird species, including Sociable Weaver.

1.6. Study methods

The following information sources were consulted for this study:

- Bird distribution data from the South African Bird Atlas Projects 1 and 2 were obtained to ascertain which bird species occur in the study area (Harrison *et al.* 1997; www.sabap2.adu.org.za; www.mybirdpatch.adu.org.za).
- The conservation status of all bird species occurring in the study area was determined using The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor, Peacock & Wanless, 2015) and the IUCN 2017 Red List.
- A description of the vegetation types occurring in the study area was obtained from The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford 2006).
- The Coordinated Avifaunal Road count project was consulted (Young *et al.* 2003), but no routes exist close to this study area.
- The Important Bird & Biodiversity Areas programme of BirdLife South Africa was consulted (Marnewick, Retief, Theron, Wright, & Anderson, 2015). There are no IBBA's close to the proposed facility.
- Several ecological or avifaunal impact assessment report for other proposed projects in the area were reviewed to obtain an understanding of avifaunal issues in the wider area (Pachnoda Consulting cc, 2015; SDP Ecological, 2016; Scherman Colloty & Associates cc, 2015).
- At the time of writing no comment or input had been received from Interested & Affected Parties or stakeholders.
- Data from the two specialist site visits in May 2017 and January 2018 was used.
- The recent "Best Practice Guidelines: Birds and Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. (Jenkins, Ralston-Paton & Smit-Robinson, 2017) was consulted for guidance on relevant aspects and for pre-construction bird monitoring requirements for the site.
- Data collected by three pre-construction bird monitoring site visits was used for the purposes of this study.

The pre-construction monitoring on site was conducted as follows:

Preliminary site assessment & design of pre-construction monitoring

- Initial brief site visit by specialist, Identification & assessment of priority bird species list, Identification & assessment of avian habitats available on and near site, Design of pre-construction monitoring methods. This was done in May 2017 (Autumn).
- The specialist site visits consisted of the following:

- Using a combination of driving and walking the site was covered as thoroughly as possible, in order to see all available habitats and maximise the likelihood of detecting all bird species present.
- All birds seen and heard were recorded using Birdlasser, 10x32 binoculars, a 20-60x spotting scope, and Garmin GPS.
- Representative photographs of bird micro habitats were taken.
- The locations of any sensitive features were annotated on a map.
- A wider area than the site itself was considered as far as possible in order to address the larger bird species which have large territories, such as Martial Eagle.

Pre-construction monitoring/data collection

- As per BirdLife guidelines (Regime 2) pre-construction bird monitoring to consist of 3 x 4 day site visits spread over approximately 6 months (July, November and late January). These site visits cover the winter, spring/early summer and mid-summer seasons. The mid-summer site visit took place after rainfall on site, and this is reflected in the bird species diversity and abundance increasing on site.
- Each site visit consisted of:
  - 12 Walked transects (each done once per site visit) to sample small passerine species. Small terrestrial birds are an important component of this programme. Given the large spatial scale of PV facilities, these smaller species may be particularly vulnerable to displacement and habitat level effects. Several regionally Red Listed or endemic small passerine species exist in the Bushmanland area. Sampling these smaller species is aimed at establishing indices of abundance for small terrestrial birds in the study area. These counts should be done when conditions are optimal. In this case this means the times when birds are most active and vocal, i.e. early mornings. Twelve walked transects (WT) of approximately 1 kilometre length each were established on the site and counted each season. Counting is done by walking slowly along the transect centre line and recording all birds seen or heard within 200m either side of the centre line. For more details see Jenkins *et al* (2017).
  - 3 Driven transects (each done twice per site visit) to sample large terrestrials and raptors. This is a very similar data collection technique to that above, the aim being to establish indices of abundance for large terrestrial species and raptors. These species are relatively easily detected from a vehicle, hence vehicle based (VT) transects are conducted in order to determine the number of birds of relevant species in the study area. Detection of these large species is less dependent on their activity levels and calls, so these counts can be done later in the day. Three VT's were established on suitable roads on and near the site, ranging between 5.1 and 9.5km in length and totalling 20.1km. These transects are each counted twice on each site visit. Counting is

done by driving slowly along the road (<40km/hr) and scanning to detect any large birds within 2km either side of the transect. The vehicle is also stopped periodically and observer scans with binoculars from a standing position. For more detail on exact methods of conducting Vehicle transects see Jenkins *et al* (2017).

- The broader area within which the site is located was surveyed for any large sensitive species breeding sites on each site visit. During the first specialist site visit a Martial Eagle 'territory' was suspected, so pre-construction monitoring was used to investigate this further.
- All incidental (i.e. not the product of any formal data collection method) observations of priority bird species were recorded.
- Surveys were conducted of any existing power lines on site for nests, collision & electrocution fatalities. These were done by driving and walking on the servitude and scanning up to 50m either side of the centre line, and on pole/pylon tops.

The layout of the pre-construction bird monitoring activities on site is shown in Figure 5.

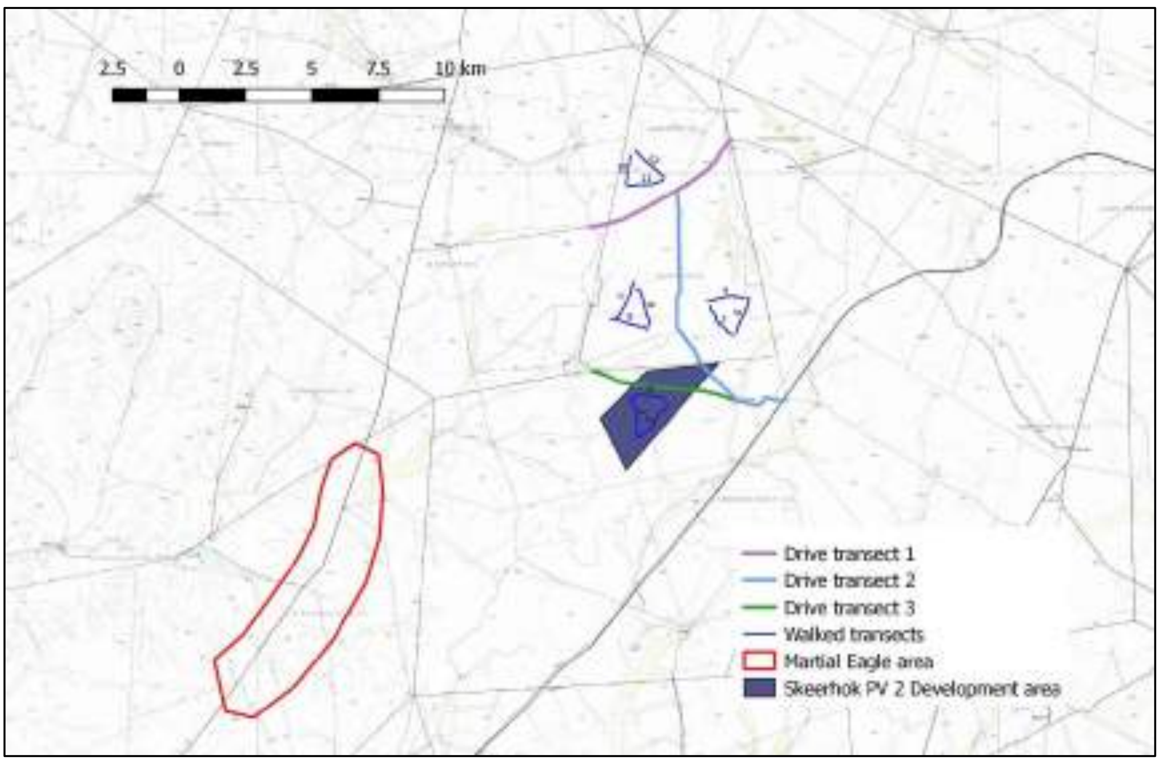

Figure 3. The layout of the bird monitoring activities on site.

1.7. Limitations & assumptions

For the purposes of this study we need to assume that conditions on site during our surveys were representative of general conditions on site, and those conditions likely to exist during the construction and operational phase of the proposed project. Given that our surveys have spanned a period of approximately 9 months (6 months minimum being required by best practice – Jenkins *et al,* 2017) and the operational lifespan of the proposed facility is likely to be at least 20 years, accurate representation is a challenge. We have chosen to examine rainfall data to shed more light on this aspect, since we believe rainfall to be the major driver of ecological and avifaunal conditions on site. We obtained annual rainfall data from the South African Weather Service for the Kenhardt area. This is displayed in Figure 4. The mean annual rainfall recorded from 1960 to 2017 (inclusive) was 147.8mm per annum. In 2017 (the year of our survey efforts) a total of 165.0mm was recorded. Rainfall in our survey year was therefore higher than average. This gives us some confidence in our findings being representative of conditions on site. If the survey year had been particularly dry this could have been cause to question the data collected on site.

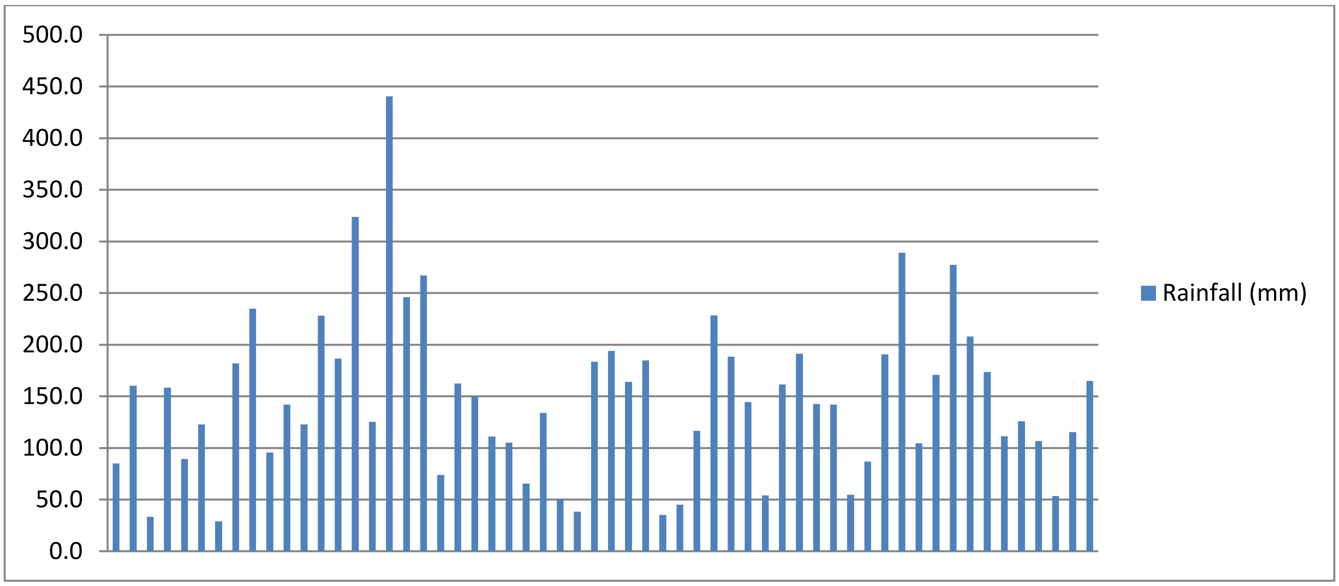

Figure 4. Annual rainfall at Kenhardt from 1960 to 2017 (South African Weather Service).

We conducted pre-construction bird monitoring for a broader area containing two other proposed facilities, Skeerhok PV 1 and Skeerhok PV 3. Our definition of the word 'site' is therefore the area encompassed by all 3 sites. Birds are mobile, and particularly in this area, they move in response to environmental conditions. We therefore consider all monitoring data and findings to apply to all 3 sites equally.

2. DESCRIPTION OF BASELINE CONDITIONS

2.1 Vegetation description

According to Mucina and Rutherford (2006), the vegetation on site is mostly “Bushmanland Arid Grassland” (see Figure 5). This is a short, sparse vegetation type, well suited to small passerine and large terrestrial bird species. Within this vegetation type, four micro habitats exist for birds: grassy and shrubby plains, drainage lines, dams and rocky outcrops. In addition the areas immediately surrounding livestock watering points are an important and distinct micro habitat, typically with an increased abundance and diversity of avifauna in response to the availability of water and different vegetation. These micro habitats are pictured in Appendix 4.

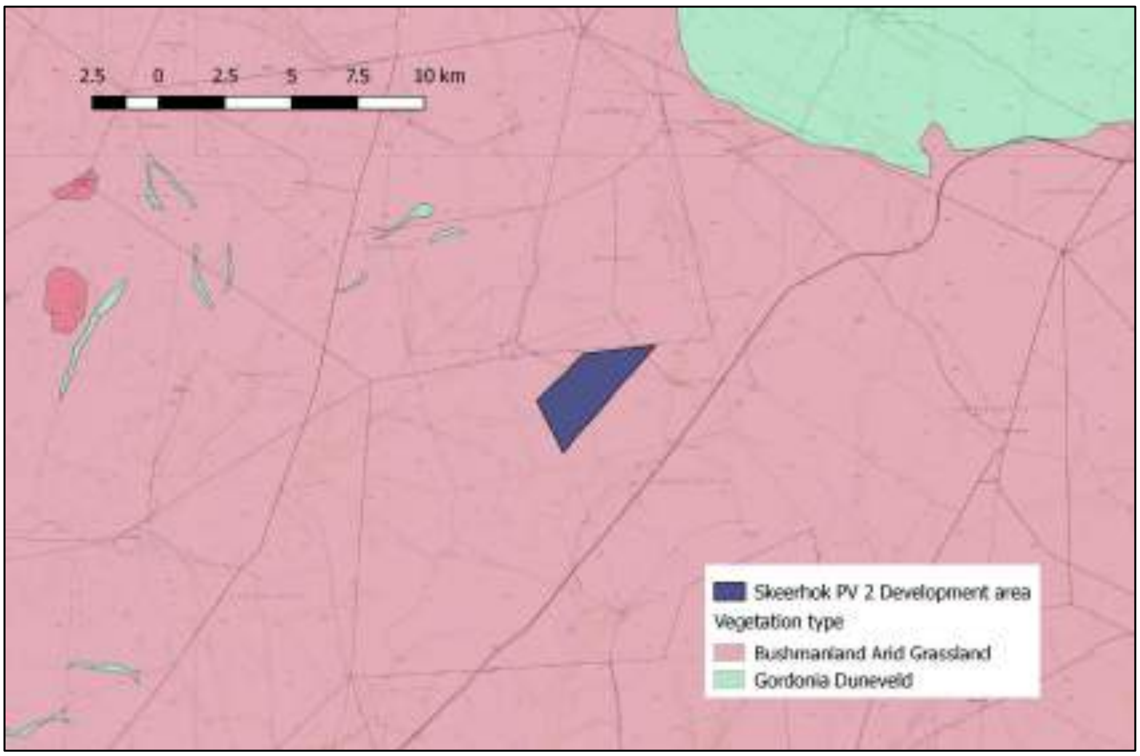

Figure 5.Vegetation classification at the proposed Skeerhok PV2 site.

2.2. Existing anthropogenic features

Although the proposed site is relatively remote, there are several significant existing infrastructures in the area. The site lies between two more or less parallel district gravel roads: the Kenhardt Louisvale road; and the Transnet road. To the immediate east of the Transnet gravel road site lies the Sishen Saldanha railway line, with associated maintenance buildings and communication towers. On the site itself, two new 400kV transmission power lines are currently in the final stages of construction. Several lower voltage distribution power lines exist in the landscape. As a result of these various activities, disturbance levels are relatively high on site for such a remote area, and the landscape is already relatively impacted on.

2.3 Avifaunal community on site

2.3.1. Southern African Bird Atlas Project data

The first and second Southern African Bird Atlas Projects (Harrison *et al*, 1997; & www.sabap2.adu.org.za) recorded a combined total of approximately 199 bird species in the broader area (30-40km radius) within which the Skeerhok PV 2 facility falls (see Appendix 3). These are the species which could occur on the Skeerhok PV 2 site if suitable habitat and conditions occur on site. They have not however all been confirmed on the site itself. Our own specialist site visits and pre-construction bird monitoring data confirms this for each species (see Section 2.3.4 & Appendix 3).

Fourteen of the 199 species which could occur on site are considered regionally Red List species (Taylor *et al*, 2015): **Ludwig's Bustard *Neotis ludwigii*** and **Martial Eagle *Polemaetus bellicosus*** are 'Endangered'; Burchell's Courser *Cursorius rufus*, Verreaux's Eagle *Aquila verreauxii*, Lanner Falcon *Falco biarmicus*, **Red Lark *Calendulauda burra*,** Secretarybird *Sagittarius serpentarius*, and Black Stork *Ciconia nigra* are 'Vulnerable'; and **Kori Bustard *Ardeotis kori*, Karoo Korhaan *Eupodotis vigorsi*i**, Sclater's Lark *Spizocorys sclateri,* Greater Flamingo *Phoenicopterus ruber*, Abdim's Stork *Ciconia abdimii* and African Rock Pipit *Anthus crenatus* are 'Near-threatened. Those species recorded on or near to the Skeerhok PV 2 site by our surveys are shown in bold above and again in Appendix 3.

Most of the above species either have large territories (e.g. Martial Eagle- approximately 113km² breeding territory – van Eeden *et al*, 2017) or are nomadic, ranging widely across the landscape, normally in response to rainfall and food availability (e.g. Ludwig's Bustard, Sclater's Lark). Red Lark is a possible exception to this, having a slightly more sedentary ecology as far as we understand at present (although local movement in relation to conditions cannot be ruled out).

This means that most of these species can be expected to utilise the proposed site occasionally but not necessarily be resident on it. This is discussed more in Section 2.4.

2.3.2. Important Bird & Biodiversity Area data

No IBBA'S exist close to the proposed Skeerhok PV 2 site (Marnewick *et al*, 2015).

2.3.3. Specialist site visit data

We conducted a one day site visit to the area in May 2017 and a two day visit in January 2018. Amongst other species, during these site visits we recorded two regionally Red Listed species on site: Karoo Korhaan (recorded multiple times, mostly in pairs); and Ludwig's Bustard (several birds seen flying in the south of the site). We also recorded two separate adult Martial Eagles *Polemaetus bellicosus* several times approximately 9km to the south-west of the site. These sightings were too far from site to be of any real concern for this assessment, but are documented for the sake of thoroughness. The repeated sightings do indicate that this may be a breeding territory, presumably with a nest somewhere in the area to the west.

2.3.4. Pre-construction bird monitoring data

In accordance with the BirdLife SA Best Practice Guidelines (Jenkins *et al*, 2017), pre-construction bird monitoring was conducted over 3 site visits in a 6 month period (July 2017 to late January 2018). Each site visit consisted of 4 days on site, conducting walked transects (to sample small passerines); driven transects (to sample large terrestrials and raptors); incidental observations of all priority species; power line surveys and breeding site surveys.

Small passerine bird data

Table 2 presents the small passerine bird data collected by walked transects on site across the 3 seasons. A total of 29 bird species were recorded by this method across the 3 seasons, with a peak in species richness in winter (21 species), followed by late summer (18) and early summer (12). None of the 29 species are regionally Red Listed. However there is a very high level of endemism amongst these species, with 6 southern African endemics and 14 Near-endemics. The most abundant species was Lark-like Bunting *Emeriza impetuani* (a near-endemic), followed by Common Swift *Apus apus* and Sociable Weaver *Philetairus socius* (an endemic). Other important species recorded on site include: Stark's Lark *Spizocorys starki* (a near-endemic which was abundant on site in all 3 seasons); Black-eared Sparrowlark *Eremopterix australis* (an endemic recorded in winter and late summer); and Grey-backed Sparrowlark *Eremopterix verticalis* (a near-endemic recorded in winter and late summer).

Red Lark *Certhilauda burra,* Sclater's Lark *Spizocorys sclateri*, and Burchell's Courser *Cursorius rufus* (all regionally Red Listed and in the case of the larks endemics) were not recorded on site by this method. Red Lark was recorded once on site (1 individual) by drive transects. Sclater's Lark and Burchell's Courser were not recorded on site by any methods.

Table 2. Summary small passerine bird species data collected by walked transects across 3 seasons.

			Total			Winter			Early summer			Mid-summer		
	Transect length		48.12			16.04			16.04			16.04		
	# species		29			21			12			18		
Common name	Scientific name	Regional Red List or Endemic	birds	rec	birds/km	birds	rec	birds /km	birds	rec	birds/km	birds	rec	birds/km
Lark-like Bunting	*Emberiza impetuani*	NE	544	38	11.31	502	22	31.30	1	1	0.06	41	15	2.56
Common Swift	*Apus apus*		244	4	5.07							244	4	15.21
Sociable Weaver	*Philetairus socius*	E	242	5	5.03	153	3	9.54				89	2	5.55
Stark's Lark	*Spizocorys starki*	NE	220	55	4.57	34	10	2.12	113	34	7.04	73	11	4.55
Spike-Heeled Lark	*Chersomanes albofasciata*	NE	135	46	2.81	80	25	4.99	23	8	1.43	32	13	2.00
Black-eared Sparrow-Lark	*Eremopterix australis*	E	133	5	2.76	67	2	4.18				66	3	4.11
Rufous-eared Warbler	*Malcorus pectoralis*		48	37	1.00	21	15	1.31	13	9	0.81	14	13	0.87
Namaqua Sandgrouse	*Pterocles namaqua*	NE	33	5	0.69	24	3	1.50				9	2	0.56
Grey-backed Sparrow-Lark	*Eremopterix verticalis*	NE	30	4	0.62	19	1	1.18				11	3	0.69
Cape Sparrow	*Passer melanurus*	NE	26	9	0.54	12	4	0.75				14	5	0.87
Scaly-Feathered Finch	*Sporopipes squamifrons*	NE	20	2	0.42	20	2	1.25						
Chat Flycatcher	*Bradornis infuscatus*	NE	18	16	0.37				11	9	0.69	7	7	0.44
Sabota Lark	*Calendulauda sabota*	NE	18	17	0.37	3	2	0.19	1	1	0.06	14	14	0.87
Yellow Canary	*Crithagra flaviventris*	NE	15	6	0.31	11	5	0.69				4	1	0.25
Ant-Eating Chat	*Myrmecocichla formicivora*	E	11	8	0.23	6	4	0.37	3	2	0.19	2	2	0.12
Large-billed Lark	*Galerida magnirostris*	E	10	9	0.21	4	3	0.25	3	3	0.19	3	3	0.19
Red-Capped Lark	*Calandrella cinerea*		7	5	0.15	7	5	0.44						
Namaqua Dove	*Oena capensis*		6	1	0.12				6	1	0.37			
Speckled Pigeon	*Columba guinea*		5	1	0.10	5	1	0.31						
Tractrac Chat	*Cercomela tractrac*	NE	5	4	0.10	5	4	0.31						
Cape Penduline Tit	*Anthoscopus minutus*	NE	4	2	0.08	2	1	0.12	2	1	0.12			
Eastern Clapper-Lark	*Mirafra fasciolata*	NE	3	3	0.06							3	3	0.17
Bokmakierie	*Telophorus zeylonus*	NE	2	2	0.04	2	2	0.12						
Double-banded Courser	*Rhinoptilus africanus*		2	1	0.04				2	1	0.12			
Karoo Long-billed Lark	*Certhilauda subcoronata*	E	2	2	0.04				2	2	0.12			

Capped Wheatear	*Oenanthe pileata*		1	1	0.02							1	1	0.06
Karoo Scrub-Robin	*Erythropygia coryphaeus*	E	1	1	0.02							1	1	0.06
Southern Grey-Headed Sparrow	*Passer diffusus*		1	1	0.02	1	1	0.06						
White-Browed Sparrow-Weaver	*Plocepasser mahali*		1	1	0.02	1	1	0.06						

NE = Near-endemic; E = Endemic. Rec = # records.

Table 3. Summary large terrestrial and raptor species data collected by driven transects across 3 seasons.

			Total			Winter			Early summer			Mid- summer		
		Transect length	120.6			40.2			40.2			40.2		
		# species	6			2			2			5		
Common name	Scientific name	Regional Red List or endemic	birds	rec	birds/ km	birds	rec	birds/ km	birds	rec	birds/ km	birds	rec	birds/ km
Northern Black Korhaan	*Afrotis afraoides*	E	17	13	0.14	2	2	0.05	9	5	0.22	6	6	0.15
Red Lark	*Calendulauda burra*	VU, E	1	1	0.01	1	1	0.02						
Double-banded Courser	*Rhinoptilus africanus*		4	2	0.03				3	1	0.07	1	1	0.02
Kori Bustard	*Ardeotis kori*	NT	1	1	0.01							1	1	0.02
Ludwig's Bustard	*Neotis ludwigii*	EN, NE	2	2	0.02							2	2	0.05
Southern Pale Chanting Goshawk	*Melierax canorus*		1	1	0.01							1	1	0.02

E = Endemic; VU = Vulnerable; NT = Near-threatened; EN = Endangered; NE = Near-endemic. Rec = # records

Table 4. Summary data for incidental observations of priority species.

			Winter		Early summer		Mid-summer	
Common name	Scientific name	Regional Red List or endemic	Birds	Rec	Birds	Rec	Birds	Rec
Ludwig's Bustard	*Neotis ludwigii*	EN, NE	2	2			4	1
Martial Eagle	*Polemaetus bellicosus*	EN	3	2				
Northern Black Korhaan	*Afrotis afraoides*	E	1	1	1	1	3	3
Pale Chanting Goshawk	*Melierax canorus*	NE	1	1	2	1	2	2

Large terrestrial and raptor data

Table 3 presents a summary of the data collected by this method. A total of 6 species were recorded by this method, 2 in winter, 2 in early summer and 5 in mid-summer. One of the 6 species, Red Lark is not typically recorded by this method (drive transects not being well suited to small species), but is included here as it is a priority species for this site and was not recorded by any other method. Three of the 6 species are regionally Red Listed: Red Lark is Vulnerable; Kori Bustard *Ardeotis kori* is Near-threatened; and Ludwig's Bustard *Neotis ludwigii* is Endangered. These 3 species are also endemic or near-endemic, and one additional species, the Northern Black Korhaan *Afrotis afraoides* is endemic but not Red Listed.

Incidental observations of priority species

Table 4 presents summary incidental observation data. Four priority species were recorded by this method: Ludwig's Bustard (Endangered, Near-endemic); Martial Eagle (Endangered); Northern Black Korhaan (Endemic); and Pale Chanting Goshawk (Near-endemic).

Existing power line surveys

The existing distribution power lines were surveyed as far as possible whilst on site. Several Sociable Weaver nests were found in the greater surveyed area. On top of one such nest we suspected a Pale Chanting Goshawk could be nesting, but this was later determined not to be the case. We recorded no bird collision or electrocution fatalities under the existing lines during this period. It is noted that two new transmission power lines were under construction during this monitoring period but were not surveyed as access was prohibited due the nature of the construction activities.

Breeding site surveys

During the winter survey the suspected Martial Eagle breeding territory (See Figure 8) was visited 4 times. On one occasion a single adult was recorded perched and on a second visit the two adults were recorded, one carrying prey (meerkat). The area was visited 6 times during early summer with no records of Martial Eagles. The mid-summer survey recorded on adult once flying in the area out of 4 visits to the area. A farm worker informed our team that the eagles are seen more frequently further to the west. Although this would require further confirmation, this may indicate that this pair of eagles resides more to the west, which would mean their nest is a considerable distance from the proposed Skeerhok site (at least 10km) and not at risk if the development goes ahead.

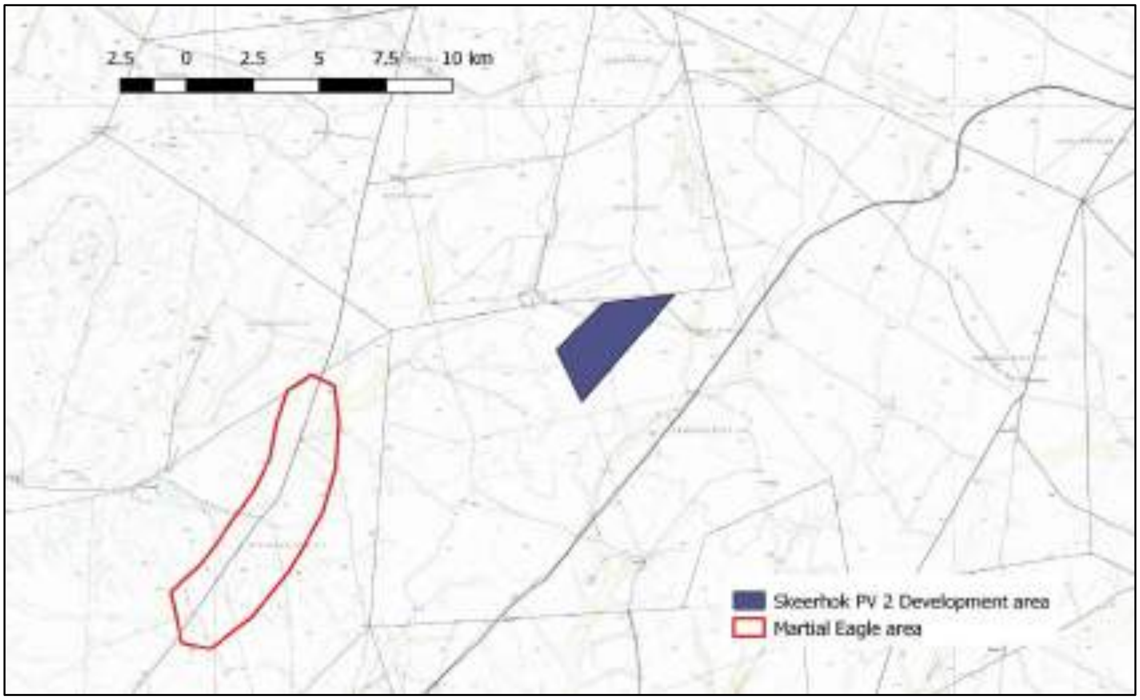

Figure 6. The suspected Martial Eagle territory relative to Skeerhok PV 2.

Overall species list

Our work on site compiled a comprehensive list of bird species recorded by all methods and incidentally. A total of 57 species were recorded on site: 43 in winter; 29 in early summer; and 41 in mid-summer (Appendix 2). Thirty of these species are endemic or near-endemic to southern Africa. Two regionally Endangered (Martial Eagle and Ludwig's Bustard) and two Vulnerable (Kori Bustard and Red Lark) were recorded.

Location of priority species records

Figure 9 presents the location of all priority species records (collected by incidental observations, driven transects, and focal site surveys). Several records of Northern Black Korhaan, Ludwig's Bustard and Stark's Lark were made on the actual footprint of the proposed Skeerhok PV 2. All records are however considered relevant since these birds move around, and a bird recorded several kilometres off the site itself could easily be found on site the following day (for example). It is important to stress that Martial Eagle was only recorded in an area approximately 9-10 km west of the proposed site. This is not far for a bird like this to travel, but the clumping of records in the area shown in Figure 9 and total absence of records on or closer to site does indicate a preference for that area by the birds.

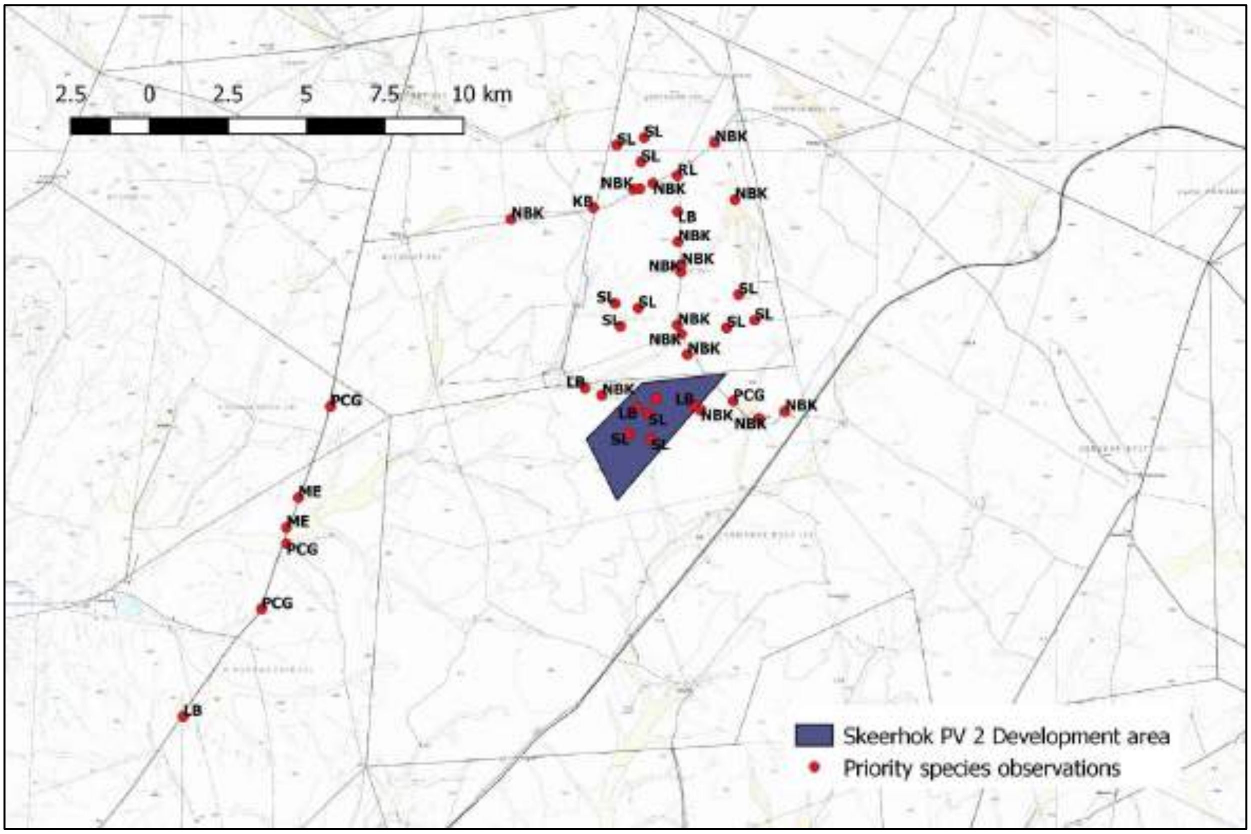

Figure 7. Location of all priority species records across all monitoring methods. LB – Ludwig's Bustard; PCG - Pale Chanting Goshawk; ME – Martial Eagle; NBK – Northern Black Korhaan; KB – Kori Bustard; SL – Stark's Lark.

2.4 Priority bird species for this site

The following is a summary of the relevance of the proposed site for the priority bird species:

2.4.1. Large terrestrial species

These physically large species are likely to be affected to some extent by disturbance and habitat destruction. They are also vulnerable to collision with overhead power lines.

Ludwig's Bustard

Ludwig's Bustard is a wide-ranging bird endemic to the south-western region of Africa (Hockey *et al.* 2005). This species was listed as globally Endangered in 2010 because of potentially unsustainable power line collision mortality, exacerbated by the rapidly expanding power grid (Jenkins *et al.* 2011, BirdLife International 2013). Ludwig's Bustards are both partially nomadic and migratory (Allan 1994, Shaw 2013), with a large proportion of the population moving west in the winter months to the Succulent Karoo. In the arid and semi-arid Karoo environment, bustards are also thought to move in response to rainfall, so the presence and abundance of bustards in any one area are not predictable. Therefore, collisions are also largely unpredictable, and vary greatly between seasons and years (Shaw 2013). While there is no evidence yet of population-level declines resulting from collision mortality, detailed range-wide power line surveys estimate that tens of thousands of bustards (from a total South African population of approximately 114,000 birds) die annually on the existing power grid in this country, which is of grave concern given that they are likely to be long-lived and slow to reproduce. It seems likely that there will be a threshold power line load at which population declines will become apparent, but it is not possible to accurately predict what this will be, and such effects will probably only be noticed when it is too late to do anything about it (Shaw 2013).

Therefore, extreme caution is necessary in the planning of any new infrastructure and in particular power lines in the range of this species.

In our view, Ludwig's Bustard could be an occasional visitor to the site, sometimes in groups if conditions are favourable. The impacts of habitat destruction and disturbance caused by the facility on this species will be of moderate significance (since the species ranges so widely). The risk of collision of this species with overhead power lines is high but this will be discussed in the Basic Assessment for the grid connection power line.

Kori Bustard

Kori Bustards are classified as regionally Near-threatened (Taylor *et al* 2015), with an estimated population of 2,000 – 5,000 birds in South Africa (Hockey *et al.* 2005). There are also worries for the population consequences of power line mortality for this species, given that some 14% of the population is estimated to die annually on Karoo transmission lines alone (Shaw 2013). Kori Bustards in the arid areas are thought to be locally nomadic (Hockey *et al.* 2005) and thus likely suffer greater collision rates than more sedentary populations in other areas (e.g. the Kalahari; Senyatso 2011).

Kori Bustard could visit the site occasionally, singly or in pairs. The impacts of habitat destruction and disturbance caused by the facility on this species will be of moderate significance. The risk of collision of this species with overhead power lines is high but this will be discussed in the Basic Assessment for the grid connection power line.

Secretarybird

This species is classified as regionally Vulnerable (Taylor *et al* 2015), and has recently been up-listed to globally Vulnerable on the basis of population declines (BirdLife International 2013). While there is no current population estimate in South Africa, there has been a reduction of sightings in the areas it previously occupied (SABAP 2 c.f. SABAP 1 data). This is probably mainly due to habitat loss, but power line collisions may also be a significant factor. The physical attributes of Secretarybirds mean that they are highly vulnerable to collision, and data from Karoo transmission lines (Shaw 2013) and the Central Incident Register (Eskom-EWT 2012) indicate that these birds do indeed collide across their range. However, as the population is sparsely distributed it is probably underrepresented in available collision data, and further research would be necessary to better understand potential population impacts of this source of unnatural mortality.

Secretarybird could utilise the site and may breed in the wider area, although we did not find any nests. We were informed by the landowner that Secretarybirds are no longer present in this area. At this stage we believe the main risk to this species will be collision with overhead power lines but this will be discussed in the Basic Assessment for the grid connection power line.

Black Stork

Black Stork is classified as Vulnerable and has experienced a population decline (Taylor *et al,* 2015). This species will be mostly confined to larger river valleys and gorges, and we do not expect it to be a regular visitor to the current study area.

We do not anticipate this species to utilise the site, and risk to the species will consequently be low.

Karoo Korhaan

Karoo Korhaan has recently been upgraded to Near-threatened (Taylor *et al* 2015). As a sedentary species, they seem to be less susceptible to collision than the larger, more mobile bustards, but they are still frequently recorded as collision victims in the Karoo, which is their stronghold (Shaw 2013). There is some evidence that Karoo Korhaans are not as abundant as previously thought (Shaw 2013), so additional mortality caused by the proposed grid connection power line is of concern.

In our opinion this species is likely to utilise the site frequently (several pairs of birds). Destruction of habitat will therefore have some effect on these pairs, of moderate significance. This species will also be susceptible to collision with overhead power lines but that will be assessed in the power line Basic Assessment.

2.4.2. Raptors

Martial Eagle

The Martial Eagle is classified as globally Near-threatened, and regionally Endangered (Taylor *et al* 2015, BirdLife International 2013). This species is well known to have adapted to using Eskom transmission line towers for perching, roosting and nesting. We recorded the species in the broader area 5 times, but not on the site itself. We were unable to locate any breeding site for the species, although it seems likely to be further west of where we recorded it.

In our view, the impact of habitat destruction on this species will be of low significance, on account of its large range relative to the size of the proposed development, the fact that it was not recorded on site, and that habitat of this type is not limited in this area. Collision and electrocution on the overhead power lines are risks to the adult birds, and more so the juveniles produced by breeding but this will be discussed in the Basic Assessment for the grid connection power line.

Verreaux's Eagle

Verreaux's Eagle is classified as regionally Vulnerable. It occurs in the broader area. This is a species that typically uses mountainous areas or at least rocky areas on account of its need for cliffs to breed on, and the habitat of its' primary prey species Rock Hyrax. This species has also learnt to nest on Eskom pylons (which opens up new areas of the country for use by the species, away from mountains), so this cannot be ruled out in this area in the future, although we did not find any such nest. We anticipate that this species could occasionally forage over the site.

Based on current information we do not believe this species is at risk on the proposed site.

Lanner Falcon

The Lanner Falcon is classed as Vulnerable and the species does seem to be in decline (Taylor *et al,* 2015). This species is susceptible to collision with overhead cables such as power lines, and also has a tendency to nest on power line structures, which could bring it into close proximity of the proposed power line.

We did not record this species on site but believe that it probably does occur in the area, and could breed on the new transmission power lines once construction is complete. This species will be at low risk from the proposed development.

2.4.3. Small terrestrial species

Burchell's Courser

Burchell's Courser is classified as Vulnerable by Taylor *et al* (2015). It is a nomadic species with an estimated regional population of <10 000 birds. It has undergone a significant reduction in population size in recent decades. This species will most likely be found on the open plains in the study area, often in the most sparse vegetation. Habitat loss is a key threat for this species, although its nomadic nature means that it would most likely move to better habitat elsewhere if disturbed or displaced from a particular site.

We did not record this species on site, but conclude that it could use the site at times. This species will be susceptible to habitat loss as a result of construction of the facility. If the species breeds on site then it would be at risk of disturbance.

Red Lark

Bushmanland is renowned for its high diversity and abundance of larks, many of which are endemic to southern Africa (Hockey *et al.* 2005). Up to 14 lark species can be seen in this area. Red Lark is listed as Vulnerable (Taylor *et al*, 2015), and has been recorded in the broader area by the SABAP project. It is a habitat specialist, utilising the red sand dunes and adjacent plains.

We recorded a single Red Lark on site during the pre-construction bird monitoring. We are also aware that the species has been recorded elsewhere in the wider area (Pachnoda Consulting cc, 2015). It is possible that a small population of this species are resident in the area. The risk to this species will in our view be of medium significance, primarily through habitat destruction.

Sclater’s Lark

Sclater’s Lark is an endemic species classified as Near-threatened by Taylor *et al* (2015). It is mostly found on stony arid plains, often associated with quartz gravel. This is a nomadic species, which moves around in response to rainfall and food availability. It has been recorded in this area by the SABAP project previously. We did not record it on site, but expect that it could utilise the site at times when conditions are right.

We conclude that this species could occur on site at times. Destruction of habitat and disturbance will be of moderate significance for this species.

Stark’s Lark

Stark’s Lark is a near-endemic species, not Red Listed. It is nomadic, moving in response to rainfall. Its preferred habitat is arid and semi-arid open plans particularly on calcrete. We recorded large numbers of the species on site through all 3 seasons. Due to this species’ endemic status and the fact that it is not well represented in protected areas, this is a priority species for this site.

We conclude that this species will be affected by habitat destruction at a moderate to high significance level if the facility is built.

3. EVALUATION OF IMPACTS

The various potential impacts that could occur as a result of the proposed facility have been identified and discussed below and rated formally in Table 5 according to criteria supplied by the CSIR (Appendix 1).

3.1. Habitat destruction associated with the construction of the facility

During the construction and maintenance phases of this project, a certain amount of habitat destruction and alteration will take place. The nature of the proposed facility means that the majority of the development footprint (PV module) will be transformed from the current vegetation to an industrial site. The vegetation under PV panels will be brushcut. This is better for habitat destruction than total clearing. In this case this surface area affected is estimated to be approximately 300 hectares. This is a substantial impact in terms of bird habitat loss on the site. We have judged the significance of this impact to be HIGH, given that a number of important arid adapted bird species will be affected. Mitigation will reduce the significance of this impact to MODERATE.

Mitigation

Since this habitat destruction is inevitable, the only meaningful mitigation for this impact is to ensure that the layout of the facility is placed on low sensitivity areas on site. More detail follows:

- Water courses, drainage lines, streams and wetlands should be avoided and a no go buffer of 100m be applied around them.
- Dams and livestock water points should likewise be avoided with a 100m no go buffer.
- Rocky outcrops should be avoided with a 100m no go buffer.
- All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.
- Care should be taken not to introduce or propagate alien plant species/weeds during construction.

3.2. Disturbance of birds & displacement effects

Disturbance of avifauna during the construction (and thereafter during maintenance and operational and decommissioning) of the facility and associated infrastructure is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. For this aspect a much larger area than the site itself is considered since disturbance effects could be relevant for several kilometres.

We have not identified any such breeding sites at this stage. We conclude the significance of this impact to be LOW both with and without mitigation and for all 3 phases: construction, operation, and decommissioning. This could change between now and construction of the facility as priority birds may move into the area and nest. In such a treeless landscape, the recent construction of the two new 400kv transmission lines in particular presents a sudden increase in nesting substrate for tree nesting bird species.

Mitigation

- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.
- Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.

3.3. Bird fatality at facility

Bird fatalities are likely to occur for a number of reasons, as discussed elsewhere in this report. Based on our data collected on bird species on site, we conclude that this impact will be of MODERATE significance reduced to LOW significance with mitigation. Overall the abundance of birds on site is low and there seems little in the way of landscape or habitat features to concentrate birds into particular areas where impacts could occur. The impact of electrocution of birds on electrical substations is possible, but is likely to be of LOW significance, as threatened bird species are not likely to frequent these switching stations and substations.

Mitigation

- The more sensitive habitat areas of the site should be avoided. A buffer area has been identified around all farm dams (of 100m) within which no PV panels or other above ground infrastructure should be built. The same should ideally apply to all livestock watering points as far as possible, and drainage lines/water courses/wetlands. This is to provide separation between the facility and water associated birds. Secondly no additional surface water sources (dams, ponds, reservoirs, treatment works etc) should be developed on or close to the PV panels in order to limit the attractiveness of the area to birds.
- The PV panels should spend as little time as possible time in a vertical position since this presents a greater collision hazard. It is not clear at this stage whether the panels will be at a fixed tilt or utilise single axis tracking.

- Very little is known about this impact in South Africa. For this reason an extensive post construction monitoring programme is recommended for this site, as prescribed by the latest relevant guidelines, in order to document any impacts and provide the basis for an adaptive management approach to any impacts.
- Mitigation is complex at electrical structures since there are many ways in which birds could get electrocuted as the hardware is complex and provides many different potential perches for birds. It is therefore recommended that mitigation be applied reactively once the facility is operational, only if a significant problem is detected. Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.

3.4. Nesting & other use of infrastructure by birds

Certain species, in particular Sociable Weaver and crows, are likely to use some of the facility infrastructure for nesting, perching and roosting. At face value this is a positive impact for birds and has been rated as LOW significance. However, nesting typically brings birds into conflict with facility management as they may make maintenance difficult for staff, and also poses a fire risk since nests present abundant fuel for fires. This will require management on site, preferably through the operational Environmental Management Plan (EMP). As with electrocutions in substation yards, the exact location of this impact is very difficult to predict at this stage and should be managed as and when it occurs, in consultation with a bird specialist and in compliance with all relevant legislation.

Mitigation

- None required for the impact of the facility on birds. For the impact of the birds nesting on the facility, we recommend nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation.
- We recommend that the operational phase EMP include provision for application to the provincial authority for permits for any necessary nest management.

3.5. Altered run off patterns

It is likely that water used to wash the panels and rainfall will fall to the bare ground and then need to runoff somewhere. If not managed correctly this could either result in water standing for long periods, which would attract birds and their prey thereby placing them at risk of collision with infrastructure, or it could result in soil erosion. This could also extend the impact of habitat destruction beyond the immediate footprint and increase the 300 hectares to a larger area if not managed correctly. This has been rated as LOW significance pre-mitigation.

Mitigation

- This will need to be managed through the development of a carefully considered surface water/drainage management plan for the site.

3.7. Chemical pollution from cleaning panels

There is a risk that if hazardous chemicals are used to clean panels and fall to the ground and enter the environment this could have secondary effects. This has been rated as LOW significance pre-mitigation.

Mitigation

- The surface water management plan should stipulate the use of environmentally friendly and acceptable cleaning products.

Table 5. Impact assessment tables.

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: Without mitigation /management	Significance of impact/risk = consequence x probability: With mitigation /management (residual risk/impact)	Ranking of impact/risk	Confidence level
CONSTRUCTION PHASE													
Clearing of vegetation	**Habitat loss/alteration**	Negative	Site	Permanent	Substantial	Definite	Low	Moderate	See Section 3.1	High (2)	Moderate(3)	1	High
General construction activities	**Disturbance**	Negative	Local	Short term	Moderate	Probable	High	Moderate	See Section 3.2	Low (4)	Low (4)	2	Medium
OPERATIONAL PHASE													
Operation of facility	**Bird fatalities**	Negative	Site	Long term	Moderate	Probable	High	Moderate	See Section 3.3	Moderate (3)	Low (4)	1	Low
	Nesting of birds	Positive	Site	Long term	Slight	Probable	High	Low	See Section 3.4	Low (4)	Low (4)	3	High
	Altered water runoff	Negative	Local	Long term	Slight	Probable	High	Low	See Section 3.5	Low (4)	Low (4)	2	Low
	Chemical pollution	Negative	Local	Long term	Slight	Probable	High	Low	See Section 3.6	Low (4)	Low (4)	4	Low
DECOMMISSIONING PHASE													

Decommissioning activities	**Disturbance**	Negative	Local	Short term	Moderate	Probable	High	Moderate	See Section 3.2	Low (4)	Low (4)	1	Medium

3.7 Cumulative effects of development on avifauna in this area

Figure 10, Table 6 and Appendix 3 present the known relevant projects within a 20km radius of the proposed Skeerhok PV 2 (information supplied by CSIR). There are 14 solar PV projects in this radius including the 3 Skeerhok PV projects. DEA has stated that no more than 6 of these projects can be awarded preferred bidder status due to the constraints of the SKA project, but for the purposed of this cumulative impact assessment we have assumed the worst case scenario of all projects being built.

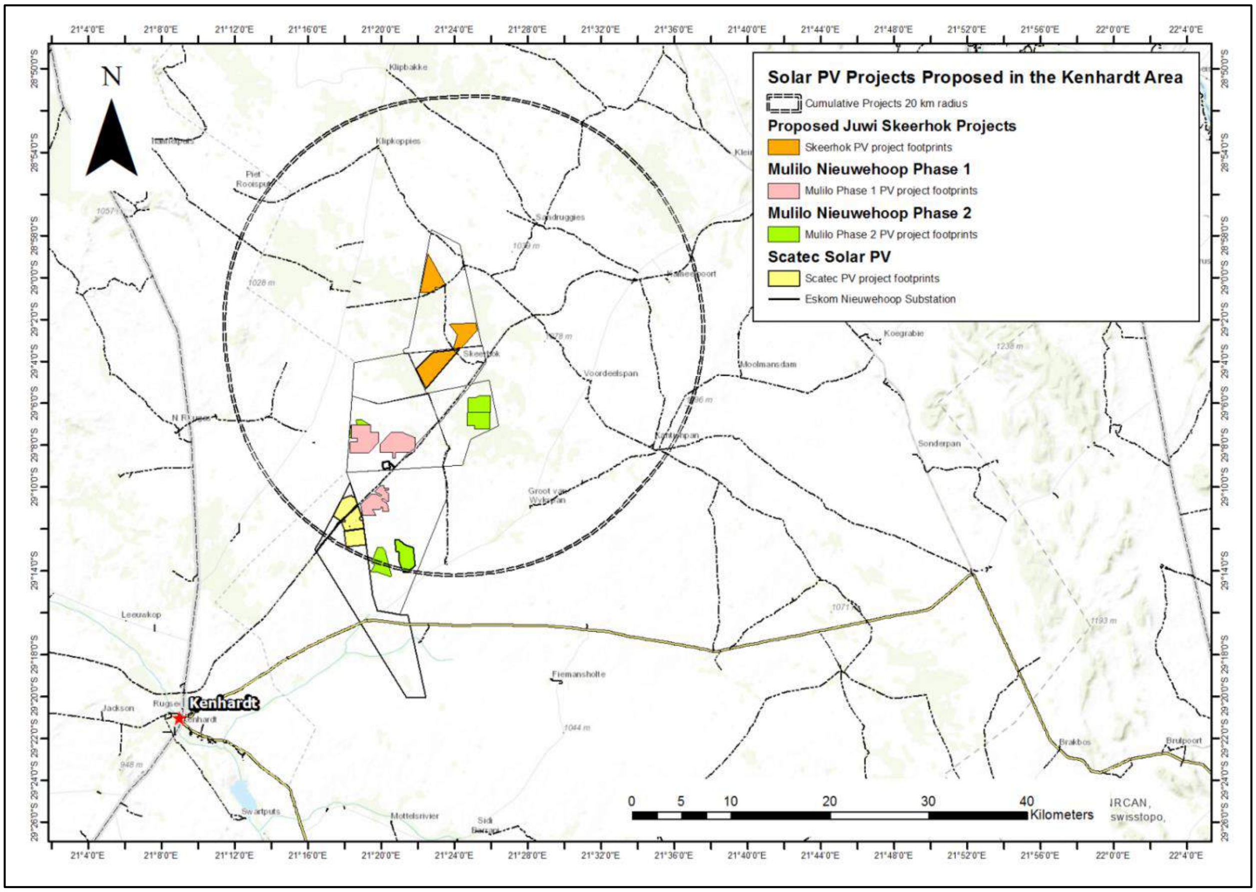

Figure 8. Projects identified by the CSIR within a 20km radius of the Skeerhok PV 2 project.

The cumulative impacts have been assessed below, according to the guidance offered by the DEA (DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria) and IFC guidelines (Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets"(International Finance Corporation)) on this matter.

Specifically, the steps undertaken in the cumulative impact assessment section of the study were as follows:

- Define and assess the impacts of the Skeerhok PV 2 project. *See Section 3.1 to 3.7*

- Identify and obtain details for all operational and authorised overhead power lines and solar energy facilities (within 20km radius of Skeerhok PV 2 activities). *See Figure 8, Table 6 & Appendix 3.*
- Identify impacts of the proposed Skeerhok PV 2 project which are also likely or already exist at the other projects. *All of the impacts described in Section 3.1 to 3.7 will occur on the other solar PV facilities. However the most important one of these impacts and the one which we know will definitely occur (i.e. some of the others are slightly speculative) is that of habitat destruction. The area of habitat which is altered or destroyed is also a good indicator of some of the other impacts. We have therefore used habitat destruction as the focus impact for the cumulative impact assessment. Habitat destruction is likely to be most significant for a suite of arid adapted endemic small species including: Red Lark, Sclater's Lark; Stark's Lark, Burchell's Courser; Black-eared and Grey-backed Sparrowlarks and others.*
- Where possible obtain reports and data for other projects. *This has been done as far as possible. In most cases specialist avifaunal studies were not done. Ecological reports considered avifauna but not comprehensively.*
- As far as possible quantify the effect of all projects on key bird species local populations (defined and estimated). *Where the amount of habitat to be altered or destroyed has been specified in other project reports this has been used. However many of the reports do not quantify this. In these cases we have assumed that a 75MW facility will destroy 250 hectares of habitat. See Table 6 for these figures.*
- Express the likely impacts associated with the Skeerhok PV 2 project as a proportion of the overall impacts on key species. *This analysis is presented in Table 6. Skeerhok PV2 will represent 8.4% of the total habitat destruction across all solar projects. We have to assume that the importance of the habitat for the relevant bird species is uniform across all this habitat. In which case Skeerhok PV 2 will contribute approximately 8.4% of the total impact of habitat destruction on birds. It is however important to note that our estimate is that all 14 projects will only take up 2.8% of the total area within the 20km radius of the Skeerhok site. Of this 2.8% Skeerhok PV 2 contributes 0.2%. in our view this is a small proportion of the broader landscape.*
- A reasoned overall opinion will be expressed on the suitability of the proposed development against the above background. This will include a cumulative impact assessment statement. *This has been presented below Table 6.*
- The decision making process with respect to the above will be clearly documented in the report. *This section.*
- Identified cumulative impacts must be clearly defined and where possible the size of the identified impact quantified and indicated. *See above and Table 6.*
- Detailed process flow and proof must be provided to indicate how the specialists' recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. *This section.*

- The cumulative impacts significance rating must also inform the need and desirability of the proposed development. *This has been addressed with the Cumulative Impacts Statement.*
- A cumulative impact environmental statement on whether the proposed development must proceed. *See below Table 6.*

Table 6. Summary information for the proposed solar facilities within 20km of Skeerhok PV 2.

Project	Capacity (MW)	Footprint (ha)	Proportion of total footprint of all projects	Proportion of 20km radius circle (125 664 hectares)
Gemsbok PV1	75	250	7.0%	0.2%
Gemsbok PV2	75	250	7.0%	0.2%
Boven PV1	75	250	7.0%	0.2%
Kenhardt PV1	75	250	7.0%	0.2%
Kenhardt PV2	75	250	7.0%	0.2%
Kenhardt PV3	75	250	7.0%	0.2%
Boven Solar PV3	75	329	9.2%	0.3%
Gemsbok PV5	75	275	7.7%	0.2%
Gemsbok PV6	75	275	7.7%	0.2%
Gemsbok PV3	75	289	8.1%	0.2%
Skeerhok PV1	100	300	8.4%	0.2%
Skeerhok PV2	100	300	8.4%	0.2%
Skeerhok PV3	100	300	8.4%	0.2%
Total	1050MW	3568ha		2.8%

Cumulative Impact Statement

The proposed facility will result in the removal of natural vegetation and the transformation from a natural landscape to a totally transformed industrial type land use. This will render that area almost totally unavailable as habitat for birds. It stands to reason that the more land is transformed in this way the greater the impact on birds. The cumulative impact of multiple solar energy facilities on birds is therefore negative. Given that we have judged the impact of this proposed Skeerhok facility to be of HIGH significance for avifauna (mitigated to MODERATE), the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative.

As mentioned above, this cumulative impact assessment assumes the worst case scenario of up to 14 solar facilities being constructed in this 20km radius. However, if as per the DEA statement, only 6 are built, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.

4. AVIFAUNAL CONSTRAINTS OR SENSITIVITY MAPPING

The sensitive features for avifauna on and near the proposed site are as follows:

1. Major drainage lines, water courses, streams, wetlands. These will be used as flight paths by various bird species and also typically contain more woody vegetation thereby providing a different micro habitat and attracting more diverse bird species. We recommend a no go buffer of 100m around these areas.

2. Farm dams. These areas provide almost the only source of surface water in this arid environment and so will attract birds. They also typically result in more woody vegetation. We recommend a no go buffer of 100m around these areas.

3. Livestock watering points. These areas attract a greater abundance and diversity of species and should be avoided by the new infrastructure. We recommend a no go buffer of 100m around these areas. If this is not possible then the water point should be closed and developed elsewhere on the farm.

4. Major rocky outcrops. These areas attract a different assemblage of small bird species and should be avoided as far as possible. We recommend a no go buffer of 100m around these.

The proposed facility layout is presented in Figure 9. The above sensitive features have already been designed out of this layout, i.e. this recommended mitigation has already been applied.

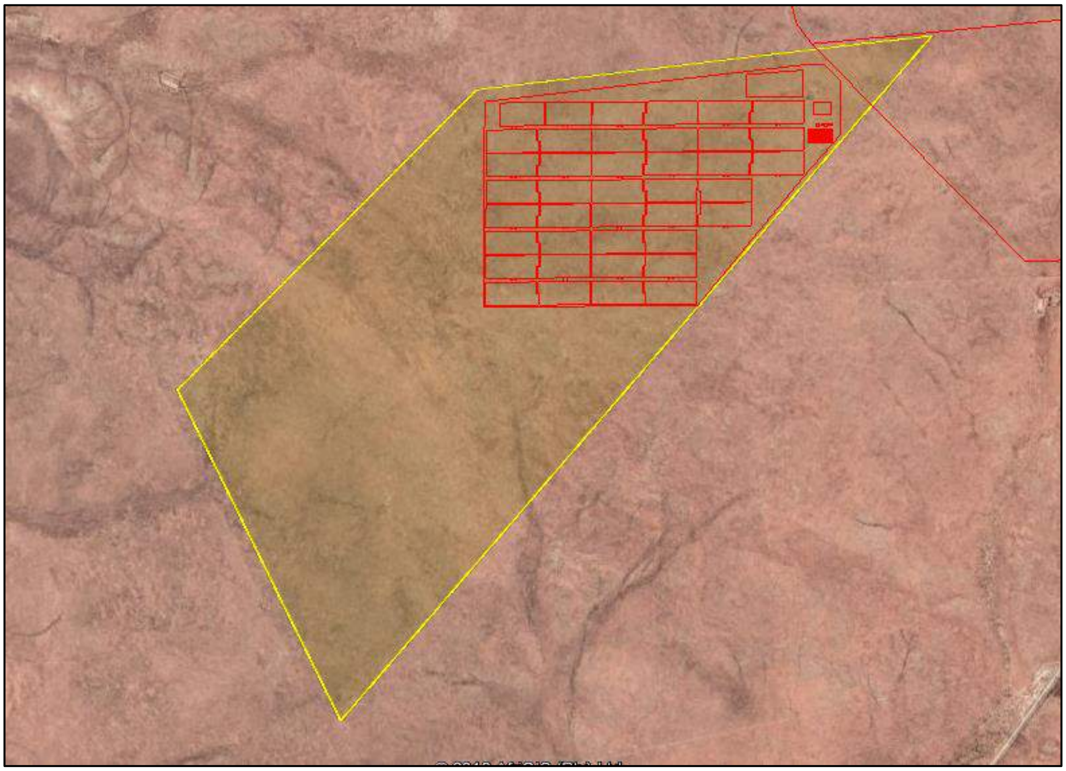

Figure 9. The detailed Skeerhok PV 2 layout superimposed on Google Earth image. The developable area is shown in yellow and the actual layout footprint in red.

5. OPERATIONAL PHASE (POST CONSTRUCTION) BIRD MONITORING FRAMEWORK

Post-construction monitoring should be started as soon as possible after the facility becomes operational. This should ensure that the immediate effects of the facility on resident and passing birds are recorded, while avoiding the confusing, short-term effects of the construction process. The below framework is that recommended by Jenkins *et al* (2017).

Post-construction bird data collection or monitoring is critical to:

- Determine the actual impacts of the facility.
- Determine if additional mitigation is required (adaptive management).
- Provide an indication of likely impacts from scaling-up (similar developments in same general area);
- Improve future assessments.

Post-construction monitoring can be divided into three categories: habitat classification; quantifying bird abundance (replicating baseline data collection); and quantifying bird mortalities.

Habitat classification

The exact 'as built' effects of the facility on the natural habitat should be delineated, classified and quantified once construction is complete. This should take into account any secondary effects such as erosion, alien plant invasion, and incomplete rehabilitation of areas used temporarily.

Bird abundance

As a rule of thumb survey protocols used in baseline data collection should be repeated during the first two years of operation (e.g. 6 months/3 seasons in year 1, and 6 months/3 seasons in year 2 for Regime 2 sites), and should be combined with monitoring of fatalities over the full two-year period. This should be subject to review at the end of this time and in the event that significant impacts are measured it may be necessary to extend data collection for longer. It may also be necessary to repeat post-construction monitoring protocols periodically (perhaps every 3-5 years) over the lifetime of the project.

Quantifying bird mortalities/fatality estimates

This should be done by a dedicated full time team of staff searching the facility regularly (recommended weekly) with a formal and measureable searching method. Any bird carcasses found should be kept on site in a freezer until all necessary information has been recorded. It will also be necessary to conduct searcher efficiency and carcass persistence trials on site to obtain estimates of these factors for use in the statistical analysis, to account for those birds not found or removed by scavengers.

Reporting

Quarterly reports, summarising interim findings should be complied and submitted to BirdLife South Africa and the Department of Environmental Affairs. At the end of each year of monitoring, a more detailed post-construction monitoring report analysing the results should be completed and submitted to relevant stakeholders (as identified by the DEA).

6. CONCLUSION

Our work on site to date has made the following findings with respect to avifauna:

- Our surveys on site took place in a slightly above average rainfall year (165.0mm in 2017 c.f. 147.8mm p.a. mean since 1960). This means that our data should be representative of typical conditions on site.
- The proposed Skeerhok site is already relatively impacted by linear infrastructure including roads, railway line, and transmission and distribution power lines.
- There are no Important Bird & Biodiversity Areas close to the proposed site.
- Walked transects on site recorded 29 small passerine bird species in total. Twenty of these species are either endemic or near endemic to southern Africa, which is a very high level of endemism. Whilst the most abundant species on site were all common species, and important endemic, Stark's Lark *Spizocorys starki* was also recorded in relatively high abundance on site. No regionally Red Listed species were recorded on site by this method.
- Driven transects on site recorded 6 priority species. Two were small passerines, Red Lark *Certhilauda burra* (Vulnerable -1 individual), and Double-banded Courser *Rhinoptilus africanus*. The 4 remaining species were: Kori Bustard *Ardeotis kori* (Near-threatened), Ludwig's Bustard *Neotis ludwigii* (Endangered), and Northern Black Korhaan *Afrotis afraoides*. Three of these species are regionally Red Listed (Taylor *et al,* 2015) as indicated above.
- Martial Eagle *Polemaetus bellicosus* (Endangered) was recorded several times off site, approximately 9km to the west. Although these birds are suspected to breed somewhere in that area (We did not locate a nest) this is too far from the proposed site to be of concern.
- A total of 57 bird species were recorded on site during our monitoring programme by all methods and incidentally. Thirty of these are endemic or near-endemic. This included 5 regionally Red Listed species, the 4 mentioned above already and Karoo Korhaan *Eupodotis vigorsii* (Near-threatened). Sclater's Lark *Spizocorys sclateri* and Burchell's Courser *Cursorius rufus* were not recorded on site during this programme, but are considered likely to visit the site occasionally when conditions are right.
- Considering the bird and habitat data collected on site we conclude that the following species will be most at risk if the proposed development goes ahead: Ludwig's Bustard; Kori Bustard; Karoo Korhaan; Red Lark; Sclater's Lark; and Stark's Lark. There are many more endemic but not Red Listed species which will also be of concern, but we feel the above suite of species serves as a good surrogate for those more common species in terms of impact assessment and management.

Our preliminary assessment of the significance of the impacts on avifauna on site is as follows:

- Habitat destruction during the construction phase will be of HIGH significance, mitigated to MODERATE significance.

- Disturbance of birds during the construction phase will be of LOW significance.
- Bird fatalities at the facility during the operational phase (mostly through collision with infrastructure) will be of MODERATE significance, mitigated to LOW.
- Nesting of birds on the facility infrastructure during the operational phase will be of LOW significance.
- Altered surface water runoff on site during the operational phase will be of LOW significance.
- Chemical pollution due to panel cleaning during the operational phase will be of LOW significance.
- Disturbance of birds during the construction phase will be of LOW significance.

Mitigation for inclusion in the EMPr

The following mitigation measures are recommended:

- Water courses, drainage lines, streams and wetlands should be avoided and a no go buffer of 100m be applied around them.
- Dams and livestock water points should likewise be avoided with a 100m no go buffer.
- Rocky outcrops should be avoided with a 100m no go buffer.
- All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.
- Care should be taken not to introduce or propagate alien plant species/weeds during construction.
- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.
- Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.
- The PV panels should spend as little time as possible time in a vertical position since this presents a greater collision hazard. It is not clear at this stage whether the panels will be able to tilt or be fixed.
- Very little is known about the impacts of solar facilities on birds in South Africa. For this reason post construction monitoring is recommended for this site in order to document any impacts and provide the basis for an adaptive management approach to any impacts.
- Mitigation is complex at electrical structures since there are many ways in which birds could get electrocuted as the hardware is complex and provides many different potential perches for birds. It is therefore recommended that mitigation be applied reactively once the facility is operational, only if a significant problem is detected. Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.

- We recommend that the operational phase EMP include provision for application to the provincial authority for permits for any necessary nest management.
- A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals.

Environmental impact statement

The Skeerhok site is important habitat for an assemblage of arid zone bird species, many of which are endemic. The transformation of natural habitat for the proposed facility will therefore be of high significance. Fortunately the facility will transform a small area relative to the remaining habitat, which is fairly uniform in the broader area. The impact of habitat destruction can be mitigated to **moderate significance** by ensuring that the more sensitive micro habitats are designated as no go areas. All other impacts are of **moderate or low** significance. We recommend that the facility be authorised, provided that the recommendations of this report are implemented.

Cumulative impact statement

The proposed facility will result in the removal of natural vegetation and the transformation from a natural landscape to a totally transformed industrial type land use. This will render that area almost totally unavailable as habitat for birds. It stands to reason that the more land is transformed in this way the greater the impact on birds. The cumulative impact of multiple solar energy facilities on birds is therefore negative. Given that we have judged the impact of this proposed Skeerhok facility to be of HIGH significance for avifauna (mitigated to MODERATE), the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative.

This cumulative impact assessment assumes the worst case scenario of up to 14 solar facilities being constructed in this 20km radius. However, if as per the DEA statement, only 6 are built, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.

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APPENDIX 1. CRITERIA AGAINST WHICH IMPACTS ARE ASSESSED (SUPPLIED BY CSIR)

The identification of potential impacts and risks should include impacts that may occur during the construction, operational and decommissioning phases of the activity. The assessment of impacts is to include 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 activity is well understood so that the impacts associated with the activity can be understood. The process of identification and assessment of impacts will include:

- Determine the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determine future changes to the environment that will occur if the activity does not proceed;
- 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.

As per DEA *Guideline 5: Assessment of Alternatives and Impacts* the following methodology is to be applied to the prediction and assessment of impacts. Potential impacts should be 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.

- **Nature of impact** - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

- **Spatial extent** – The size of the area that will be affected by the risk/impact:
  - Site;
  - 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 risk/impact will be experienced:
  - Very short term (instantaneous);

- Short term (less than 1 year);
- Medium term (1 to 10 years);
- Long term (the impact 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)).

- **Reversibility of impacts -**
  - High reversibility of impacts (impact is highly reversible at end of project life, i.e. this is the most favourable assessment for the environment. For example, the nuisance factor caused by noise impacts associated with the operational phase of an exporting terminal can be considered to be highly reversible at the end of the project life);
  - 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. The impact is permanent. For example, the loss of a palaeontological resource on the site caused by building foundations could be non-reversible).

- **Irreplaceability of resource loss caused by impacts –**
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment. For example, if the project will destroy unique wetland systems, these may be irreplaceable);
  - 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 will further be assessed in terms of the following:

- **Probability** – The probability of the impact occurring:
  - Improbable (little or no chance of occurring);
  - Probable (<50% chance of occurring);
  - Highly probable (50 – 90% chance of occurring); or
  - Definite (>90% chance of occurring regardless of prevention measures).

- **Consequence**–The anticipated severity of the 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).

- **Significance** – To determine the significance of an identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1 below). The 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, very high) against a predefined set of criteria (as shown in Figure 1 below).

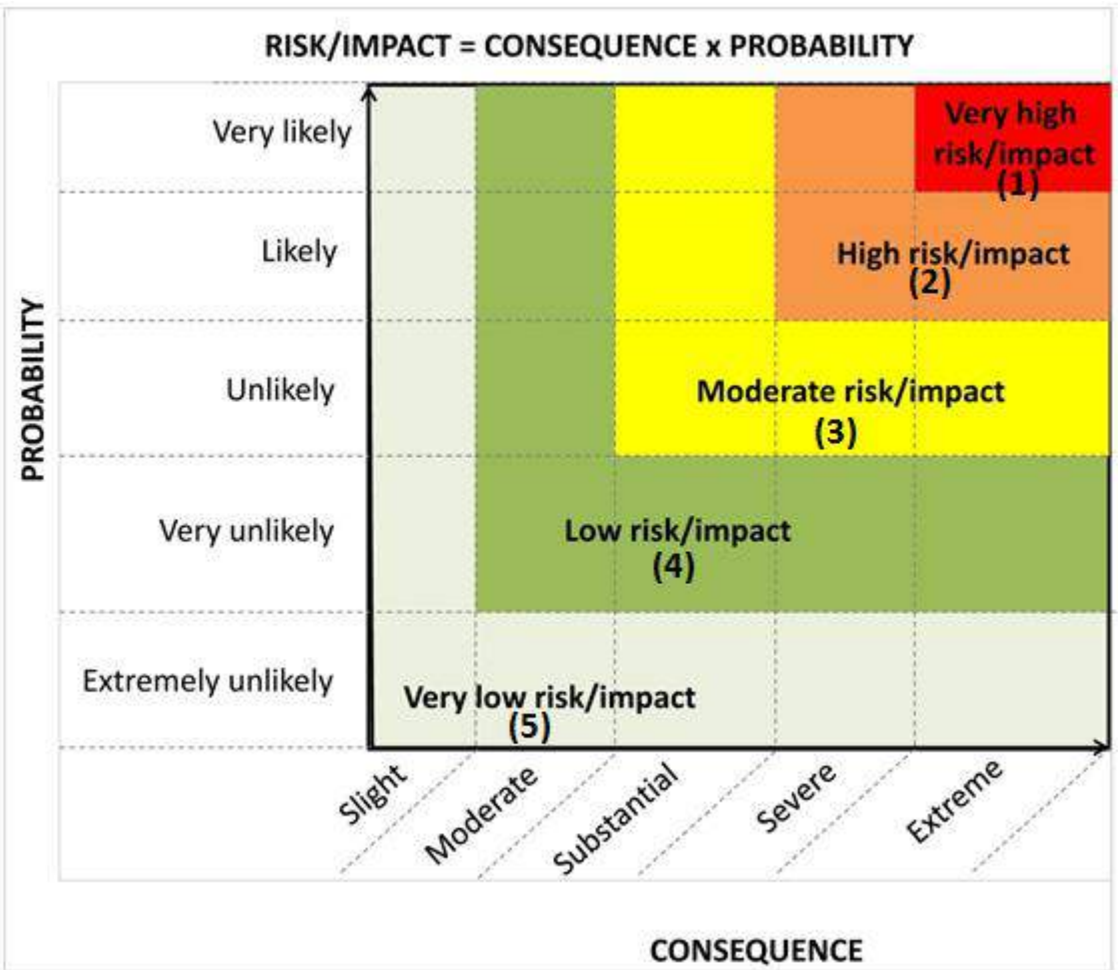

Figure 1: Guide to assessing risk/impact significance as a result of consequence and probability.

- **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); or
- High (the risk/impacts will result in a considerable alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making).
- Very high (the risk/impacts 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 (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

The above assessment must be described in the text (with clear explanation provided on the rationale for the allocation of significance ratings) and summarised in an impact assessment Table in a similar manner as shown in the example below (Table 1).

With the implementation of mitigation measures, the residual impacts/risks must be ranked as follows in terms of significance:

- Very low = 5;
- Low = 4;
- Moderate = 3;
- High = 2; and
- Very high = 1.

- **Status** - Whether the impact on the overall environment (social, biophysical and economic) will be:
  - Positive - environment overall will benefit from the impact;
  - Negative - environment overall will be adversely affected by the impact; or
  - Neutral - environment overall will not be affected.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low;
  - Medium; or
  - High.

Impacts will then be collated into an EMPr and these will include the following:

- Management actions and monitoring of the impacts;

- Identifying negative impacts and prescribing mitigation measures to avoid or reduce negative impacts; and
- Positive impacts will be identified and enhanced where possible.

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

- Impacts will be evaluated for the construction, operational and decommissioning phases of the development. The assessment of impacts for the decommissioning phase will be 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;
- The impact evaluation will, where possible, take 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 will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.
- Impacts should be assessed for all layouts and project components.
- **IMPORTANT NOTE FROM THE CSIR**: Impacts should be described both before and after the proposed mitigation and management measures have been implemented. The assessment of the potential impact "before mitigation" should take into consideration all management actions that are already part of the project design (which are a given). The assessment of the potential impact "after mitigation" should take into consideration any additional management actions proposed by the specialist, to minimise negative or enhance positive impacts.

APPENDIX 2. BIRD SPECIES RECORDED IN THE BROADER STUDY AREA BY THE SABAP 1 & SABAP 2 PROJECTS; & CONFIRMED BY ON SITE PRE-CONSTRUCTION BIRD MONITORING.

'1' denotes presence, not abundance

E – Endemic, NE – near-endemic

EN – Endangered; VU – Vulnerable; NT – Near-threatened

Regional Red List – Taylor *et al*, 2015

SABAP1 – recorded by this project

SABAP2 – recorded by this project

Winter, Early Summer, Mid-summer – recorded in these seasons

Common name	Scientific name	Regional Red List	Endemic/near	SABAP1	SABAP2	Winter	Early summer	Mid-summer
Avocet, Pied	*Recurvirostra avosetta*			1				
Barbet, Acacia Pied	*Tricholaema leucomelas*			1	1	1	1	1
Barbet, Crested	*Trachyphonus vaillantii*				1			
Batis, Pririt	*Batis pririt*			1	1			
Bee-eater, European	*Merops apiaster*			1	1			
Bee-eater, Swallow-tailed	*Merops hirundineus*			1	1			
Bishop, Southern Red	*Euplectes orix*			1	1			
Bokmakierie	*Telophorus zeylonus*		NE	1	1	1		
Brubru	*Nilaus afer*			1				
Bulbul, African Red-eyed	*Pycnonotus nigricans*		NE	1	1	1		1
Bunting, Cape	*Emberiza capensis*			1		1		1
Bunting, Cinnamon-breasted	*Emberiza tahapisi*				1			
Bunting, Lark-like	*Emberiza impetuani*		NE	1	1	1	1	1
Bustard, Kori	*Ardeotis kori*	VU		1	1			1
Bustard, Ludwig's	*Neotis ludwigii*	EN	NE	1	1	1		1
Buzzard, Jackal	*Buteo rufofuscus*			1				
Canary, Black-headed	*Serinus alario*			1	1			

Canary, Black-throated	*Crithagra atrogularis*			1	1	1		
Canary, White-throated	*Crithagra albogularis*			1	1			
Canary, Yellow	*Crithagra flaviventris*		NE	1	1	1	1	
Chat, Ant-eating	*Myrmecocichla formicivora*		E	1	1	1	1	1
Chat, Familiar	*Cercomela familiaris*			1	1	1		
Chat, Karoo	*Cercomela schlegelii*			1	1			
Chat, Sickle-winged	*Cercomela sinuata*			1	1			
Chat, Tractrac	*Cercomela tractrac*		NE	1	1	1	1	
Cisticola, Desert	*Cisticola aridulus*			1	1			
Cisticola, Grey-backed	*Cisticola subruficapilla*			1				
Coot, Red-knobbed	*Fulica cristata*			1				
Cormorant, Reed	*Phalacrocorax africanus*			1	1			
Cormorant, White-breasted	*Phalacrocorax carbo*			1	1			
Courser, Burchell's	*Cursorius rufus*			1	1			
Courser, Double-banded	*Rhinoptilus africanus*			1	1		1	1
Crombec, Long-billed	*Sylvietta rufescens*			1	1			
Crow, Pied	*Corvus albus*			1	1	1	1	1
Cuckoo, Diderick	*Chrysococcyx caprius*			1				
Cuckoo, Jacobin	*Clamator jacobinus*			1				
Darter, African	*Anhinga rufa*			1				
Dove, Laughing	*Streptopelia senegalensis*			1	1			1
Dove, Namaqua	*Oena capensis*			1	1	1	1	1
Dove, Red-eyed	*Streptopelia semitorquata*			1				
Dove, Rock	*Columba livia*			1				
Drongo, Fork-tailed	*Dicrurus adsimilis*			1	1			
Duck, Maccoa	*Oxyura maccoa*			1				
Duck, Yellow-billed	*Anas undulata*			1				
Eagle, Booted	*Aquila pennatus*			1				
Eagle, Martial	*Polemaetus bellicosus*	EN		1	1	1		1
Eagle, Verreaux's	*Aquila verreauxii*	VU		1	1			
Eagle-owl, Spotted	*Bubo africanus*			1	1			
Egret, Cattle	*Bubulcus ibis*			1				

Egret, Little	*Egretta garzetta*			1				
Eremomela, Yellow-bellied	*Eremomela icteropygialis*			1	1	1		
Falcon, Lanner	*Falco biarmicus*	VU		1	1			
Falcon, Pygmy	*Polihierax semitorquatus*			1	1	1		1
Finch, Red-headed	*Amadina erythrocephala*			1	1			
Finch, Scaly-feathered	*Sporopipes squamifrons*		NE	1	1	1		1
Fiscal, Common (Southern)	*Lanius collaris*			1	1	1	1	1
Fish-eagle, African	*Haliaeetus vocifer*			1	1			
Flamingo, Greater	*Phoenicopterus ruber*	NT		1				
Flycatcher, Chat	*Bradornis infuscatus*			1	1	1	1	1
Flycatcher, Fairy	*Stenostira scita*			1				
Flycatcher, Fiscal	*Sigelus silens*			1	1			
Flycatcher, Marico	*Bradornis mariquensis*				1			
Flycatcher, Spotted	*Muscicapa striata*			1				
Goose, Egyptian	*Alopochen aegyptiacus*			1	1			
Goose, Spur-winged	*Plectropterus gambensis*			1	1			
Goshawk, Pale Chanting	*Melierax canorus*		NE	1	1	1	1	1
Grebe, Black-necked	*Podiceps nigricollis*				1			
Grebe, Little	*Tachybaptus ruficollis*			1				
Greenshank, Common	*Tringa nebularia*			1	1			
Guineafowl, Helmeted	*Numida meleagris*			1	1			
Gull, Grey-headed	*Larus cirrocephalus*			1				
Hamerkop	*Scopus umbretta*			1				
Harrier, Montagu's	*Circus pygargus*			1				
Harrier-Hawk, African	*Polyboroides typus*			1				
Heron, Black-headed	*Ardea melanocephala*			1				
Heron, Goliath	*Ardea goliath*			1				
Heron, Grey	*Ardea cinerea*			1	1			
Hoopoe, African	*Upupa africana*			1				
Ibis, African Sacred	*Threskiornis aethiopicus*			1				
Ibis, Glossy	*Plegadis falcinellus*			1				
Ibis, Hadeda	*Bostrychia hagedash*				1			

Kestrel, Greater	*Falco rupicoloides*			1	1			
Kestrel, Lesser	*Falco naumanni*				1			
Kestrel, Rock	*Falco rupicolus*			1	1		1	1
Kite, Black	*Milvus migrans*			1				
Kite, Black-shouldered	*Elanus caeruleus*			1				
Kite, Yellow-billed	*Milvus aegyptius*			1				
Korhaan, Karoo	*Eupodotis vigorsii*			1	1			
Korhaan, Northern Black	*Afrotis afraoides*		NE		1	1	1	1
Lapwing, Blacksmith	*Vanellus armatus*			1	1			
Lapwing, Crowned	*Vanellus coronatus*			1	1	1	1	1
Lark, Eastern Clapper	*Mirafra fasciolata*		NE		1			1
Lark, Fawn-coloured	*Calendulauda africanoides*			1	1			
Lark, Karoo Long-billed	*Certhilauda subcoronata*		E	1	1	1	1	1
Lark, Large-billed	*Galerida magnirostris*		E	1		1	1	1
Lark, Long-billed	*Mirafra curvirostris*			1				
Lark, Red	*Calendulauda burra*	VU	NE		1	1		
Lark, Red-capped	*Calandrella cinerea*			1		1		
Lark, Sabota	*Calendulauda sabota*		NE	1	1	1	1	1
Lark, Sclater's	*Spizocorys sclateri*	NT		1	1			
Lark, Spike-heeled	*Chersomanes albofasciata*		NE	1	1	1	1	1
Lark, Stark's	*Spizocorys starki*		NE	1	1	1	1	1
Lovebird, Rosy-faced	*Agapornis roseicollis*			1				
Martin, Brown-throated	*Riparia paludicola*			1				
Martin, Rock	*Hirundo fuligula*			1	1			
Masked-weaver, Southern	*Ploceus velatus*			1	1			
Moorhen, Common	*Gallinula chloropus*			1				
Mousebird, Red-faced	*Urocolius indicus*			1	1			
Mousebird, White-backed	*Colius colius*		E	1	1		1	1
Nightjar, Rufous-cheeked	*Caprimulgus rufigena*			1	1			
Ostrich, Common	*Struthio camelus*			1	1			
Owl, Barn	*Tyto alba*			1	1			
Palm-swift, African	*Cypsiurus parvus*			1				

Penduline-tit, Cape	*Anthoscopus minutus*		NE	1	1	1	1	
Pigeon, Speckled	*Columba guinea*			1	1	1	1	
Pipit, African	*Anthus cinnamomeus*			1	1			1
Pipit, African Rock	*Anthus crenatus*			1				
Plover, Kittlitz's	*Charadrius pecuarius*			1	1			
Plover, Three-banded	*Charadrius tricollaris*			1	1			1
Pochard, Southern	*Netta erythrophthalma*			1				
Prinia, Black-chested	*Prinia flavicans*			1	1			
Prinia, Karoo	*Prinia maculosa*				1			
Quail, Common	*Coturnix coturnix*			1				
Quelea, Red-billed	*Quelea quelea*			1	1			
Reed-warbler, African	*Acrocephalus baeticatus*			1	1			
Robin-chat, Cape	*Cossypha caffra*			1				
Rock-thrush, Short-toed	*Monticola brevipes*			1				
Roller, Lilac-breasted	*Coracias caudatus*				1			
Ruff	*Philomachus pugnax*			1				
Sanderling	*Calidris alba*			1				
Sandgrouse, Namaqua	*Pterocles namaqua*		NE	1	1	1		1
Sandpiper, Common	*Actitis hypoleucos*			1	1			
Sandpiper, Curlew	*Calidris ferruginea*			1				
Sandpiper, Marsh	*Tringa stagnatilis*			1				
Sandpiper, Wood	*Tringa glareola*			1				
Scimitarbill, Common	*Rhinopomastus cyanomelas*			1	1			
Scops-owl, Southern White-faced	*Ptilopsus granti*			1				
Scrub-robin, Kalahari	*Cercotrichas paena*		NE	1	1	1	1	1
Scrub-robin, Karoo	*Cercotrichas coryphoeus*		E	1	1			1
Secretarybird	*Sagittarius serpentarius*	VU		1				
Shelduck, South African	*Tadorna cana*			1	1			
Shoveler, Cape	*Anas smithii*			1				
Shrike, Crimson-breasted	*Laniarius atrococcineus*		NE		1	1		
Shrike, Lesser Grey	*Lanius minor*			1	1			

Shrike, Red-backed	*Lanius collurio*			1				
Snake-eagle, Black-chested	*Circaetus pectoralis*			1				
Sparrow, Cape	*Passer melanurus*		E	1	1	1	1	1
Sparrow, House	*Passer domesticus*			1	1		1	
Sparrow, Southern Grey-headed	*Passer diffusus*				1	1		
Sparrow-weaver, White-browed	*Plocepasser mahali*			1	1	1		
Sparrowlark, Black-eared	*Eremopterix australis*		E	1	1	1		1
Sparrowlark, Grey-backed	*Eremopterix verticalis*		NE	1	1	1		1
Spoonbill, African	*Platalea alba*			1				
Starling, Cape Glossy	*Lamprotornis nitens*			1	1			
Starling, Pale-winged	*Onychognathus nabouroup*			1	1			
Starling, Wattled	*Creatophora cinerea*			1				
Stilt, Black-winged	*Himantopus himantopus*			1				
Stint, Little	*Calidris minuta*			1				
Stonechat, African	*Saxicola torquatus*			1				
Stork, Abdim's	*Ciconia abdimii*	NT		1				
Stork, Black	*Ciconia nigra*	VU		1				
Stork, White	*Ciconia ciconia*			1				
Sunbird, Dusky	*Cinnyris fuscus*		NE	1	1		1	
Sunbird, Southern Double-collared	*Cinnyris chalybeus*				1			
Swallow, Barn	*Hirundo rustica*			1	1			
Swallow, Greater Striped	*Hirundo cucullata*			1	1			
Swallow, Pearl-breasted	*Hirundo dimidiata*				1			
Swallow, White-throated	*Hirundo albigularis*			1				
Swamp-warbler, Lesser	*Acrocephalus gracilirostris*			1				
Swift, Alpine	*Tachymarptis melba*			1				
Swift, Bradfield's	*Apus bradfieldi*			1				
Swift, Common	*Apus apus*			1				1
Swift, Little	*Apus affinis*			1	1			
Swift, White-rumped	*Apus caffer*			1	1			1
Teal, Cape	*Anas capensis*			1	1			

Teal, Red-billed	*Anas erythrorhyncha*		1	1			
Tern, White-winged	*Chlidonias leucopterus*		1				
Thick-knee, Spotted	*Burhinus capensis*		1	1			
Thrush, Karoo	*Turdus smithi*		1	1			
Thrush, Olive	*Turdus olivaceus*		1				
Tit, Ashy	*Parus cinerascens*		1	1			
Tit, Grey	*Parus afer*			1			
Tit-babbler, Chestnut-vented	*Parisoma subcaeruleum*		1	1			
Tit-babbler, Layard's	*Parisoma layardi*		1				
Turtle-dove, Cape	*Streptopelia capicola*		1	1			1
Wagtail, Cape	*Motacilla capensis*		1	1			
Warbler, Cinnamon-breasted	*Euryptila subcinnamomea*		1				
Warbler, Namaqua	*Phragmacia substriata*		1				
Warbler, Rufous-eared	*Malcorus pectoralis*	E	1	1	1	1	1
Warbler, Willow	*Phylloscopus trochilus*		1	1			
Waxbill, Black-faced	*Estrilda erythronotos*			1			
Waxbill, Common	*Estrilda astrild*		1				
Weaver, Sociable	*Philetairus socius*	E	1	1	1	1	1
Wheatear, Capped	*Oenanthe pileata*		1	1	1	1	1
Wheatear, Mountain	*Oenanthe monticola*	NE	1	1	1		
White-eye, Cape	*Zosterops virens*		1	1			
White-eye, Orange River	*Zosterops pallidus*		1				
Whydah, Pin-tailed	*Vidua macroura*		1				
Woodpecker, Cardinal	*Dendropicos fuscescens*		1				

APPENDIX 3. PROJECTS PROPOSED IN THE VICINITY OF THE SKEERHOK PV 2 PROJECT (SUPPLIED BY CSIR) .

Project Name	Applicant	DEA Reference Number	Brief project description	Phase
Nieuwehoop 400/50 kV Substation loop in and loop out lines, Northern Cape Province.	Eskom Holdings SOC Limited	DEA Reference Number: 12/12/20/1166	Construction of the 400/50kv Nieuwehoop substation between the Garona and Aries substations, and 3km Loop In and Loop Out Lines.	The project received a positive EA on 21 February 2011. The substation has been constructed.
EIA, WULA and EMPr for the proposed Solar CSP Integration Project: Project 1 – Solar substation, 2 X 400 kV power lines from Aries to the solar substation and 400 kV power line from Nieuwehoop to the Solar substation.	Eskom Holdings SOC Limited	DEA Reference Number: 12/12/20/2606 NEAS Reference Number: DEA/EIA/0000785/2011	The proposed Solar Park Integration Project entails the construction of a substation at the Upington Solar Park, 400 kV transmission lines to the east and south of Upington to feed the electricity into Eskom's National Grid as well as the construction of a number of 132 kV power lines inter-linking the IPP solar plants with the Eskom Grid and distributing the power generated to Upington.	The project received a positive EA on 14 February 2014.
Proposed construction of Gemsbok PV1 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA Reference Number: 14/12/16/3/3/2/710	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Gemsbok Bult (Remaining Extent of Portion 3 of Farm 120).	These projects have received Environmental Authorization on 09/11/2015
Proposed construction of Gemsbok PV2 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA Reference Number: 14/12/16/3/3/2/711	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Gemsbok Bult (Remaining Extent of Portion 3 of Farm 120).	
Proposed construction of Boven PV1 75 MW Solar PV facility on the remaining extent of the Farm Boven Rugzeer 169, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA Reference Number: 14/12/16/3/3/2/712	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Boven Rugzeer (Remaining Extent of Farm 169).	
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.	Scatec Solar	14/12/16/3/3/2/837	Scatec Solar intends to develop a 75 MW Solar PV power generation project on the remaining extent of Onder Rugzeer Farm 168.	These projects have received Environmental Authorization on 07/08/2017

Project Name	Applicant	DEA Reference Number	Brief project description	Phase
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.	Scatec Solar	14/12/16/3/3/2/838	Scatec Solar intends to develop a 75 MW Solar PV power generation project on the remaining extent of Onder Rugzeer Farm 168.	
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.	Scatec Solar	14/12/16/3/3/2/836	Scatec Solar intends to develop a 75 MW Solar PV power generation project on the remaining extent of Onder Rugzeer Farm 168.	
Proposed development of a 132 kV 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.	Scatec Solar	14/12/16/3/3/1/1547	Scatec Solar intends to develop a 132 KV transmission line extending from the proposed 75 MW Solar PV facility (Kenhardt PV 1) to the Eskom Nieuwehoop substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.	These projects have received Environmental Authorization on 22/09/2017
Proposed development of a 132 kV 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.	Scatec Solar	14/12/16/3/3/1/1546	Scatec Solar intends to develop a 132 KV transmission line extending from the proposed 75 MW Solar PV facility (Kenhardt PV 2) to the Eskom Nieuwehoop substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.	
Proposed development of a 132 kV 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.	Scatec Solar	14/12/16/3/3/1/1545	Scatec Solar intends to develop a 132 KV transmission line extending from the proposed 75 MW Solar PV facility (Kenhardt PV 3) to the Eskom Nieuwehoop substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.	
Proposed development of a 75 MW Solar PV Facility (Boven Solar PV 3) on	Mulilo Renewable	14/12/16/3/3/2/846	Mulilo Renewable Project Developments (Pty) Ltd proposes to develop a 75 MW Solar PV power	Appeal process for these projects is

Project Name	Applicant	DEA Reference Number	Brief project description	Phase
the remaining extent of Boven Rugzeer Farm 169, north-east of Kenhardt, Northern Cape.	Project Developments (Pty) Ltd		generation project on the Remaining extent of Boven Rugzeer Farm 169.	underway.
Proposed development of a 75 MW Solar PV Facility (Gemsbok Solar PV 5) on Portion 8 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	14/12/16/3/3/2/843	Mulilo Renewable Project Developments (Pty) Ltd proposes to develop a 75 MW Solar PV power generation project on Portion 8 of Gemsbok Bult Farm 120.	
Proposed development of a 75 MW Solar PV Facility (Gemsbok Solar PV 6) on Portion 8 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	14/12/16/3/3/2/846	Mulilo Renewable Project Developments (Pty) Ltd proposes to develop a 75 MW Solar PV power generation project on Portion 8 of Gemsbok Bult Farm 120.	
Proposed development of a 75 MW Solar PV Facility (Gemsbok Solar PV 3) on Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	14/12/16/3/3/2/841	Mulilo Renewable Project Developments (Pty) Ltd proposes to develop a 75 MW Solar PV power generation project on Portion 3 of Gemsbok Bult Farm 120.	

APPENDIX 4. PHOTOGRAPHS OF MICRO HABITATS AVAILABLE TO BIRDS ON THE SKEERHOK PV 2 SITE.

APPENDIX 5. SPECIALIST CURRICULUM VITAE.

JONATHAN JAMES SMALLIE

WildSkies Ecological Services (2011/131435/07)

Curriculum Vitae

BACKGROUND

Date of birth:	20 October 1975
Qualifications:	BSC – Agriculture (Hons) (completed 1998)
	University of Natal – Pietermaritzburg
	MSC – Environmental Science (completed 2011)
	University of Witwaterstrand
Occupation:	Specialist avifaunal consultant
Profession registration:	South African Council for Natural Scientific Professions

CONTACT DETAILS

Cell number: 082 444 8919

Fax: 086 615 5654

Email: jon@wildskies.co.za

Postal: 36 Utrecht Avenue, Bonnie Doon, East London, 5210

PROFESSIONAL EXPERIENCE

Consulting Projects:

Post construction bird monitoring for wind energy facilities:

Dassieklip (Caledon) –initiated in April 2014; Dorper Wind Farm (Molteno) – initiated in July 2014; Jeffreys Bay Wind Farm – initiated in August 2014; Kouga Wind Farm – started Feb 2015; Cookhouse West Wind Farm – started March 2015; Grassridge Wind Farm – initiated in April 2015; Chaba Wind Farm – initiated December 2015; Amakhala Emoyeni 01 Wind Farm initiated August 2016; Gibson Bay Wind Farm – initiated March 2017; Nojoli Wind Farm initiated March 2017.

Pre-construction bird monitoring & EIA for wind energy facilities:

Golden Valley; Middleton; Dorper; Qumbu; Ncora; Nqamakhwe; Ndakana; Thomas River; Peddie; Mossel Bay; Hluhluwe; Richards Bay; Garob; Outeniqua; Castle; Wolf; Inyanda-Roodeplaat; Dassiesridge; Great Kei; Bayview; Grahamstown; Bakenskop; Umsobomvu; Stormberg; Zingesele; Oasis; Gunstfontein; Naumanii; Golden Valley Phase 2; Ngxwabangu; Hlobo; Woodstock; and Impofu wind energy facilities.

Other Electricity Generation projects:

Port of Nqura Power Barge EIA; Bonnievale Solar Energy Facility; Dealesville Solar Energy Facility; Rooipunt Solar Energy Facility; De Aar Solar Energy Facility; Noupoort Solar Energy Facility, Aggeneys Solar Energy Facility; Tugela Hydro-Electric Scheme; Eskom Concentrated Solar Power Plant; Bronkhorstspruit Solar Photovoltaic Plant; De Aar Solar Energy Facility; Paulputs Solar Energy Facility; Kenhardt Solar Energy Facility.

Overhead transmission power lines (>132 000 kilovolts):

Oranjemund Gromis 220kv; Perseus Gamma 765kv; Aries Kronos 765kv; Aries Helios 765kv; Perseus Kronos 765kv; Helios Juno 765kv; Borutho Nzelele 400kv; Foskor Merensky 275kv; Kimberley Strengthening; Mercury Perseus 400kV; Eros Neptune Grassridge 400kV; Kudu Juno 400kV; Garona Aries 400kV; Perseus Hydra 765Kv; Tabor Witkop 275kV; Tabor Spencer 400kV; Moropule Orapa 220kV (Botswana); Coega Electrification; Majuba Venus 765kV; Gamma Grassridge 765kV; Gourikwa Proteus 400KV; Koeberg Strengthening 400kV; Ariadne Eros 400kV; Hydra Gamma 765kV; Zizabona transmission - Botswana

Overhead distribution power lines (<132 000 kilovolts):

Kanoneiland 22KV; Hydra Gamma 765kV; Komani Manzana 132kV; Rockdale Middelburg 132kV; Irenedale 132 kV; Zandfontein 132kV; Venulu Makonde 132 kV; Spencer Makonde 132 kV; Dalkeith Jackal Creek 132Kv; Glen Austin 88kV; Bulgerivier 132kV; Ottawa Tongaat 132kV; Disselfontein 132kV; Voorspoed Mine 132kV; Wonderfontein 132kV; Kabokweni Hlau Hlau 132kV; Hazyview Kiepersol 132kV; Mayfern Delta 132kV; VAAL Vresap 88kV; Arthursview Modderkuil 88kV; Orapa, AK6, Lethakane substations and 66kV lines (Botswana); Dagbreek Hermon 66kV; Uitkoms Majuba 88kV; Pilanesberg Spitskop 132kV; Qumbu PG Bison 132kV; Louis Trichardt Venetia 132kV; Rockdale Middelburg Ferrochrome 132kV; New Continental Cement 132KV; Hillside 88kV; Marathon Delta 132kV; Malelane Boulder 132kV; Nondela Strengthening 132kV; Spitskop Northern Plats 132kV; West Acres Mataffin 132kV; Westgate Tarlton Kromdraai 132kV; Sappi Elliot Ugie 132kV; Melkhout Thyspunt 132kV; St Francis Bay 66kv

Risk Assessments on existing power lines:

Hydra-Droerivier 1,2 & 3 400kV; Hydra-Poseidon 1,2 400kV; Butterworth Ncora 66kV; Nieu-Bethesda 22kV; Maclear 22kV (Joelshoek Valley Project); Wodehouse 22kV (Dordrecht district); Burgersdorp Aliwal North Jamestown 22kV; Cradock 22kV; Colesberg area 22kV; Loxton self build 11kV; Kanoneiland 22kV; Stutterheim Municipality 22kV; Majuba-Venus 400kV; Chivelston-Mersey 400kV; Marathon-Prairie 275kV; Delphi-Neptune 400kV; Ingagane – Bloukrans 275kV; Ingagane – Danskraal 275kV; Danskraal – Bloukrans 275kV

Avifaunal "walk through" (EMP's):

Kappa Omega 765kv; Rockdale Marble Hall 400kv*;* Beta Delphi 400kV; Mercury Perseus 765kV; Perseus 765kV Substation; Beta Turn 765kV in lines; Spencer Tabor 400kV line; Kabokweni Hlau Hlau 132kV; Mayfern Delta 132Kv; Eros Mtata 400kV; Cennergi Grid connect 132kV; Melkhout Thyspunt 132kv.

Strategic Environmental Assessments for Master Electrification Plans:

Northern Johannesburg area; Southern KZN and Northern Eastern Cape; Northern Pretoria; Western Cape Peninsula

Other specialist studies:

Bird Impact Assessment for Lizzard Point Golf Estate – Vaaldam; Bird Impact Assessment for Lever Creek Estates housing development; Investigation into rotating Bird Flapper saga – Aberdeen 22Kv; Investigation of in excess of 80 separate incidents of bird mortalities on power line networks from August 1999 to present; Investigation of bird mortalities at 3 substations; Special investigation into faulting on Ariadne-Eros 132kV; Special investigation into Bald Ibis faulting on Tutuka Pegasus 275kV; Special investigation into bird related faulting on 22kV Geluk Hendrina line; Special investigation into bird related faulting on Camden Chivelston 400kV line

Specialist risk assessments for wildlife airport hazards:

Kigali International Airport – Rwanda; Port Elizabeth Airport – specialist study as part of the EIA for the proposed Madiba Bay Leisure Park; Manzini International Airport (Swaziland); Polokwane International Airport; Mafekeng International Airport; Lanseria Airport

Positions held to date:

- ✓ August 1999 to May 2004: Eastern Cape field officer for the South African Crane Working Group of the Endangered Wildlife Trust
- ✓ May 2004 to November 2007: National Field officer for Eskom-EWT Strategic Partnership and Airports Company SA – EWT Strategic Partnership (both programmes of Endangered Wildlife Trust)
- ✓ November 2007 to August 2011: Programme Manager – Wildlife & Energy Programme – Endangered Wildlife Trust
- ✓ August 2011 to present: Independent avifaunal specialist – Director at WildSkies Ecological Sevices (Pty) Ltd

Relevant achievements:

- ✓ Recipient of BirdLife South Africa’s Giant Eagle Owl in 2011 for outstanding contribution to bird conservation in SA
- ✓ Founded and chaired for first two years – the Birds and Wind Energy Specialist Group (BAWESG) of the Endangered Wildlife Trust & BirdLife South Africa.

Conferences attended and presented at:

- ✓ May 2011. Conference of Wind Energy and Wildlife, Trondheim, Norway.

- ✓ March 2011. Chair and facilitator at Endangered Wildlife Trust – Wildlife & Energy Programme – "2011 Wildlife & Energy Symposium", Howick, SA
- ✓ September 2010 – Raptor Research Foundation conference, Fort Collins, Colorado. Presented on the use of camera traps to investigate Cape Vulture roosting behaviour on transmission lines
- ✓ May 2010 - Wind Power Africa 2010. Presented on wind energy and birds
- ✓ October 2008. Session chair at Pan-African Ornithological Conference, Cape Town, South Africa
- ✓ March 27 – 30 2006: International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. Presented a paper entitled "Assessing the power line network in the Kwa-Zulu Natal Province of South Africa from a vulture interaction perspective".
- ✓ June 2005: IASTED Conference at Benalmadena, Spain – presented a paper entitled "Impact of bird streamers on quality of supply on transmission lines: a case study"
- ✓ May 2005: International Bird Strike Committee 27th meeting – Athens, Greece. Presented a paper entitled Bird Strike Data analysis at SA airports 1999 to 2004.
- ✓ 2003: Presented a talk on "Birds & Power lines" at the 2003 AGM of the Amalgamated Municipal Electrical Unions – in Stutterheim - Eastern Cape
- ✓ September 2000: 5th World Conference on Birds of Prey in Seville, Spain.

Papers & publications:

- ✓ Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Guidelines on how to avoid or mitigate impacts of electricity power grids on migratory birds in the African-Eurasian Region. CMS Technical Series Number XX. Bonn, Germany.
- ✓ Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Review of the conflict between migratory birds and electricity power grids in the African-Eurasian region. CMS Technical Series Number XX, Bonn, Germany.
- ✓ Jenkins, A.R., van Rooyen, C.S, Smallie, J.J, Harrison, J.A., Diamond, M.D., Smit-Robinson, H.A & Ralston, S. 2014. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa
- ✓ Jenkins, A.R., Shaw, J.M., Smallie, J.J., Gibbons, B., Visagie, R. & Ryan, P.G. 2011. Estimating the impacts of power line collisions on Ludwig's Bustards Neotis ludwigii. Bird Conservation International.
- ✓ Jordan, M., & Smallie, J. 2010. A briefing document on best practice for pre-construction assessment of the impacts of onshore wind farms on birds. Endangered Wildlife Trust , Unpublished report
- ✓ Smallie, J., & Virani, M.Z. 2010. A preliminary assessment of the potential risks from electrical infrastructure to large birds in Kenya. Scopus 30: p32-39
- ✓ Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. A preliminary survey of avian mortality on power lines in the Overberg, South Africa. Ostrich 2010. 81 (2) p109-113
- ✓ Jenkins, A.R., Smallie, J.J., & Diamond, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International 2010. 20: 263-278.
- ✓ Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. Modelling power line collision risk for the Blue Crane *Anthropoides paradiseus* in South Africa. Ibis 2010 (152) p590-599.
- ✓ Jenkins, A.R., Allan, D.G., & Smallie, J.J. 2009. Does electrification of the Lesotho Highlands pose a threat to that countries unique montane raptor fauna? Dubious evidence from surveys of three existing power lines. Gabar 20 (2).
- ✓ Smallie, J.J., Diamond, M., & Jenkins, A.R. 2008. Lighting up the African continent – what does this mean for our birds? Pp 38-43. In Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H., & Muchai. (eds). Proceedings of the 12th Pan-african Ornithological Congress. 2008. Cape Town. Animal Demography Unit. ISBN (978-0-7992-2361-3)
- ✓ Van Rooyen, C., & Smallie, J.J. 2006. The Eskom –EWT Strategic Partnership in South Africa: a brief summary. Nature & Faunae Vol 21: Issue 2, p25

- ✓ Smallie, J. & Froneman, A. 2005. Bird Strike data analysis at South African Airports 1999 to 2004. Proceedings of the 27th Conference of the International Bird Strike Committee, Athens Greece.
- ✓ Smallie, J. & Van Rooyen, C. 2005. Impact of bird streamers on quality of supply on transmission lines: a case study. Proceedings of the Fifth IASTED International Conference on Power and Energy Systems, Benalmadena, Spain.
- ✓ Smallie, J. & Van Rooyen, C. 2003. Risk assessment of bird interaction on the Hydra-Droërivier 1 and 2 400kV. Unpublished report to Eskom Transmission Group. Endangered Wildlife Trust. Johannesburg. South Africa
- ✓ Van Rooyen, C. Jenkins, A. De Goede, J. & Smallie J. 2003. Environmentally acceptable ways to minimise the incidence of power outages associated with large raptor nests on Eskom pylons in the Karoo: Lessons learnt to date. Project number 9RE-00005 / R1127 Technology Services International. Johannesburg. South Africa
- ✓ Smallie, J. J. & O'connor, T. G. (2000) Elephant utilization of *Colophospermum mopane*: possible benefits of hedging. African Journal of Ecology 38 (4), 352-359.

Courses & training:

- ✓ Successfully completed a 5 day course in High Voltage Regulations (modules 1 to 10) conducted by Eskom – Southern Region
- ✓ Successfully completed training on, and obtained authorization for, live line installation of Bird Flappers

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX K:

Heritage Report

HERITAGE IMPACT ASSESSMENT:
SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF THE SKEERHOK PV2 SOLAR ENERGY FACILITY ON GEMSBOKBULT 120/9, KENHARDT MAGISTERIAL DISTRICT, NORTHERN CAPE PROVINCE

SAHRA Case No.: 11819

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999).

Report for:

CSIR – Environmental Management Services
P.O. Box 320, Stellenbosch, 7599
Tel: 021 8882432
Email: kstroebel@csir.co.za

On behalf of:

juwi Renewable Energies (Pty) Ltd

Dr Jayson Orton
ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
Tel: (021) 788 8425 | 083 272 3225
Email: jayson@asha-consulting.co.za

23 January 2018

Specialist declaration

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

HIA: Scoping and Environmental Impact Assessment for the proposed development of three 100 MW Solar Photovoltaic Facilities (Skeerhok PV 1, PV 2, & PV 3) & 132 kV overhead transmission line near Kenhardt in the Northern Cape Province

Specialist:	**ASHA Consulting (Pty) Ltd**		
Contact person:	**Dr Jayson Orton**		
Postal address:	40 Brassie Street, Lakeside		
Postal code:	7945	Cell:	083 272 3225
Telephone:	(021) 788 8425	Fax:	
E-mail:	jayson@asha-consulting.co.za		
Professional affiliation(s) (if any)			

Project Consultant:	Council for Scientific and Industrial Research		
Contact person:	Kelly Stroebel		
Postal address:	PO Box 320, Stellenbosch		
Postal code:	7599	Cell:	082 660 1907
Telephone:	021 888 2432	Fax:	021 888 4693
E-mail:	Kstroebel@csir.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Jayson Orton declare that -- General

declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

ASHA Consulting (Pty) Ltd

Name of company (if applicable):

24 / 01 / 2018

Date:

EXECUTIVE SUMMARY

ASHA Consulting (Pty) Ltd was appointed by juwi Renewable Energies (Pty) Ltd to assess the potential impacts to heritage resources that might occur through the proposed construction of the 100 MW Skeerhok PV2 Solar Energy Facility, located some 39 km northeast of Kenhardt, !Kheis Local Municipality, Kenhardt Magisterial District, Northern Cape (S29° 03’ 50” E21° 23’ 18”). The project would be constructed on the farm Gemsbokbult 120, portion 9.

A survey of the area showed it to be flat with occasional gravel areas and generally light vegetation cover. Archaeological material was found to be very sparsely distributed across the study area but one site of low-medium significance was located within the proposed development footprint. Impacts in the development footprint are expected to be of moderate significance before mitigation and very low significance after mitigation. Palaeontological impacts are highly unlikely to occur and are of no concern. Impacts are expected to be of very low significance. Graves may be present but because of the very low likelihood of finding any the potential impact significance was rated as being very low. No other specific heritage resources were identified on site but the broader landscape carries a degree of heritage significance. Because of the already existing ‘electrical layer’ on this landscape and the fact that it has been identified for a hub of solar development, the significance of impacts to this landscape are considered to be low both before and after mitigation. Cumulative impacts are likely to be of essentially the same significance as the construction impacts because of the very low density of significant heritage resources on the broader landscape.

Because no highly significant impacts to heritage resources are envisaged, it is recommended that planning and construction of the proposed Skeerhok PV2 solar energy facility should be authorised but subject to the following conditions which should be incorporated into the Environmental Authorisation:

- The archaeological site at waypoint 836 (GBB2017/001) must be sampled if it cannot be avoided;
- Fencing around the facility is to be visually permeable;
- The use of white paint on structures should be minimised with earthy tones favoured;
- The archaeological site at SHK2017/003 should be cordoned off and all access to it prevented;
- A final archaeological walk down survey of both the facility footprint and any associated linear features must be carried out at least six months in advance of construction;
- Staff must be made aware of the small possibility of locating buried fossils and should this occur they must be left in place and immediately reported to the ECO and/or the heritage authorities; and
- If any 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.

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency.

Contact site: An archaeological site that is essentially Stone Age in character but which includes historical materials obtained via trade or exchange with, or wages from, Europeans.

Diagnostic: Artefacts bearing features identifying them to a particular period of time.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Hand-axe: A bifacially flaked, pointed stone tool type typical of the Early Stone Age.

Holocene: The geological period spanning the last approximately 10-12 000 years.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Hominin: a smaller group consisting of modern humans, extinct species of humans and all their immediate ancestors.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BAR: Basic Assessment Report

CSIR: Council for Scientific and Industrial Research

CRM: Cultural Resources Management

DEA: Department of Environmental Affairs

ECO: Environmental Control Officer

EIA: Environmental Impact Assessment

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

MSA: Middle Stone Age

LSA: Later Stone Age

NBKB: Ngwao-Boswa Ya Kapa Bokoni

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

NID: Notification of Intent to Develop

PPP: Public Participation Process

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

SKA: Square Kilometre Array

Compliance with Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R326 (7 April 2017)	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.4 Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii (Preliminary Section of this report)
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 4, 5, 6, 7 and 8.2
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying alternatives;	Section 1.1.1
g) an identification of any areas to be avoided, including buffers;	Section 10.2
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 10.2
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6
k) any mitigation measures for inclusion in the EMPr;	Section 9
l) any conditions for inclusion in the environmental authorisation;	Section 14
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity and activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 14
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 12
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Please refer to Appendix G of the Draft EIAR for comments from SAHRA.
q) any other information requested by the competent authority.	Please refer to Appendix H of the Draft EIAR
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	n/a

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by juwi Renewable Energies (Pty) Ltd to assess the potential impacts to heritage resources that might occur through the proposed construction of the 100 MW Skeerhok PV2 Solar Energy Facility, located some 39 km northeast of Kenhardt, !Kheis Local Municipality, Kenhardt Magisterial District, Northern Cape (S29° 03’ 50” E21° 23’ 18”). The project would be constructed on the farm Gemsbokbult 120, portion 9 (Figures 1 & 2). Note that the grid connection for this project is being assessed in a separate Basic Assessment Report (BAR) process.

1.1. Project description

The project is being developed with a maximum possible installed capacity of 114 MWdc which produces 100 MWac of electricity. Generation is expected to continue for a period of at least 20 years. Although approximately 400 ha of land was assessed, the facility would require about 300 ha of land for the entire development footprint, panels and associated infrastructure. The project would include the following components:

- ≤250 ha PV array with panels up to about 5 m high and mounted via either free field single-axis trackers or fixed tilt PV solar module mounting structures comprised of galvanised steel and aluminium;
- Inverters, transformers, mini-substations and on-site collector substation;
- Below ground electrical cables linking the above components;
- A 32 m high telecommunications mast within the collector substation area;
- Site office and operations and maintenance buildings covering approximately 1 ha and including storage areas, parking, offices, ablution facilities, septic tank, water storage facility and central waste collection area;
- Permanent and temporary laydown areas covering approximately 1 ha;
- A battery storage facility up to 8 m high;
- ≤ 15 km of internal gravel access road ≤ 8 m wide linking the Transnet Service road to the site;
- ≤ 10 km of gravel service roads ≤ 8 m wide within the facility;
- ≤3.5 km length of water supply pipeline connecting existing boreholes to storage, alternatively water will supplied by the local municipality;
- Stormwater drainage; and
- Perimeter fencing 3m high with access gate and guard house.

In addition, the following temporary facilities would be required for the construction period only:

- ≤1 ha site office area;
- ≤ 10 ha laydown area; and
- ≤1 ha concrete batching plant

1.1.1. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant since roads and excavations for foundations, cables or pipelines may impact on archaeological and/or palaeontological remains, while the above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

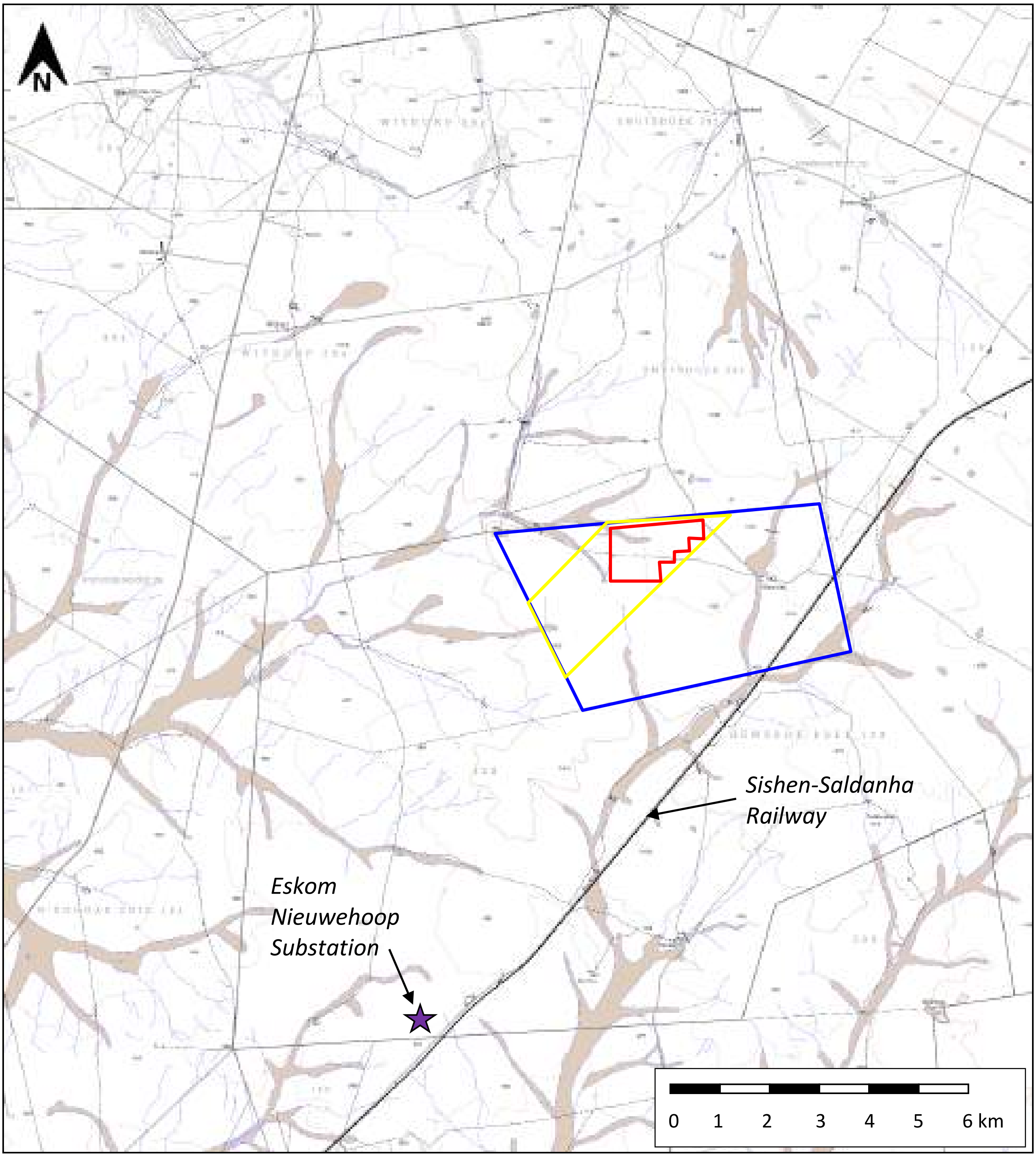

Figure 1: *Extract from 1:50 000 topographic maps 2821CD & 2921AB showing the location of the layout (red polygon), study area (yellow polygon) and farm portion (blue polygon). Source: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

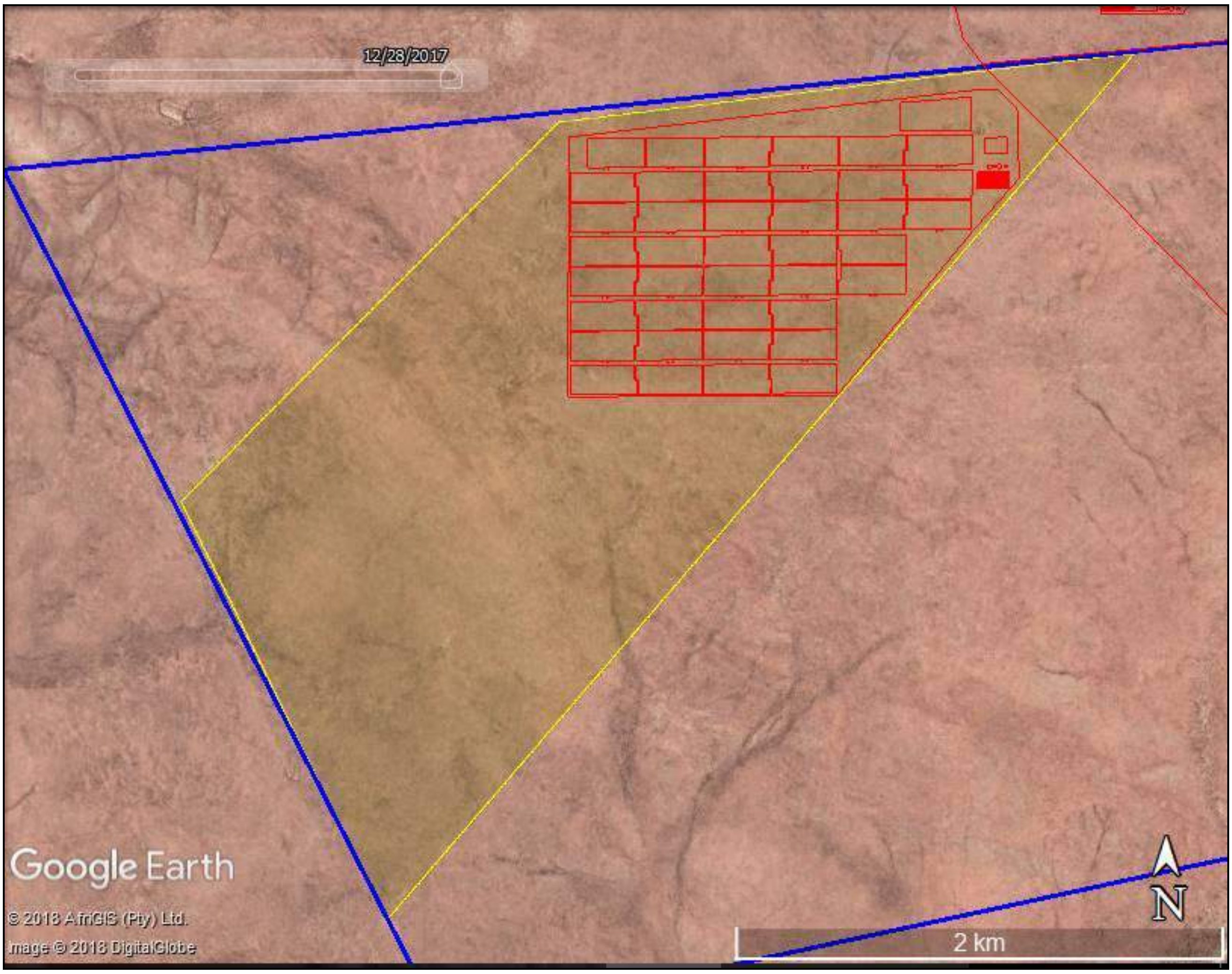

Figure 2: *Aerial view of the study area showing the proposed facility layout (red outlines), the assessed development area (yellow polygon) and the farm portion boundary (blue).*

1.2. Terms of reference

ASHA Consulting was asked to compile a heritage impact assessment (HIA) that included all relevant aspects of heritage, but particularly including palaeontology, archaeology and the cultural landscape which were seen as likely to be the most significant aspects.

The South African Heritage Resources Agency (SAHRA) was notified of the proposed project and the scoping report was submitted to them. SAHRA, in a letter dated 10 November 2017, requested the submission of a full HIA that included an assessment of the impacts to archaeology and palaeontology and also considered the potential visual impacts to heritage resources. This HIA is being submitted to SAHRA at the time of the release of the Draft EIAR for public comment.

It should also be noted, however, that following S.38(3) of the National Heritage Resources Act (No. 25 of 1999), even though certain specialist studies may be specifically requested, <u>all</u> heritage resources should be identified and assessed.

1.3. Scope and purpose of the report

A heritage impact assessment (HIA) is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued for consideration by the National Department of Environmental Affairs (DEA) who will review the Environmental Impact Assessment (EIA) and grant or withhold authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;
- Palaeontological material: “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace”;
- Archaeological material: a) “material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures”; b) “rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose

rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";

- Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of S.38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision. Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. The present report provides the heritage component. Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DEA.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:50 000 map and historical aerial images were sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

The site was subjected to a detailed foot survey on 30 June and 3 July 2017. The survey was during mid-winter, although seasonality in this part of South Africa, where vegetation is minimal at all times of the year, had no material effect on the fieldwork. During the survey the positions of finds were recorded on a hand-held Global Positioning System (GPS) receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

3.3. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by the CSIR. The impact assessment methodology used for this HIA can be found in Chapter 4 of the Draft EIAR.

3.4. Grading

Section 7 of the NHRA provides for the grading of heritage resources into those of National (Grade 1), Provincial (Grade 2) and Local (Grade 3) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade 1 and 2 resources are intended to be managed by the national and provincial heritage resources authorities, while Grade 3 resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. SAHRA (2007) has formulated its own system[1] for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' and rated with an A (high/medium significance, requires mitigation), B (medium significance, requires recording) or C (low significance, requires no further action).

3.5. Assumptions and limitations

The study was carried out at the surface only and hence any completely buried archaeological sites or palaeontological occurrences will not be readily located. Similarly, it is not always possible to determine the depth of archaeological or palaeontological material visible at the surface. Due to the large size of the site (and others surveyed during the same project) it was impractical to cover the entire area in detail. This means that the results of the survey are indicative of the types of heritage resources likely to be present. It should be noted, however, that all obvious features such as pans and rocky hills were covered in greater detail such that the chances of having missed important heritage resources are very small. Because they were not available for study at the time of the survey, linear features such as the proposed access road alternatives and the water pipeline route were not examined in the field.

Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts within a 20 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts include a total of twelve other PV plants (Figure 3), the already constructed Eskom Nieuwehoop Substation (Figure

[1] The system is intended for use on archaeological and palaeontological sites only.

3) and various associated power lines. However, it is notable that the DEA has issued a statement that a maximum of six PV facilities in this area will be issued with preferred bidder status due to the potential negative impacts on the Square Kilometre Array (SKA)

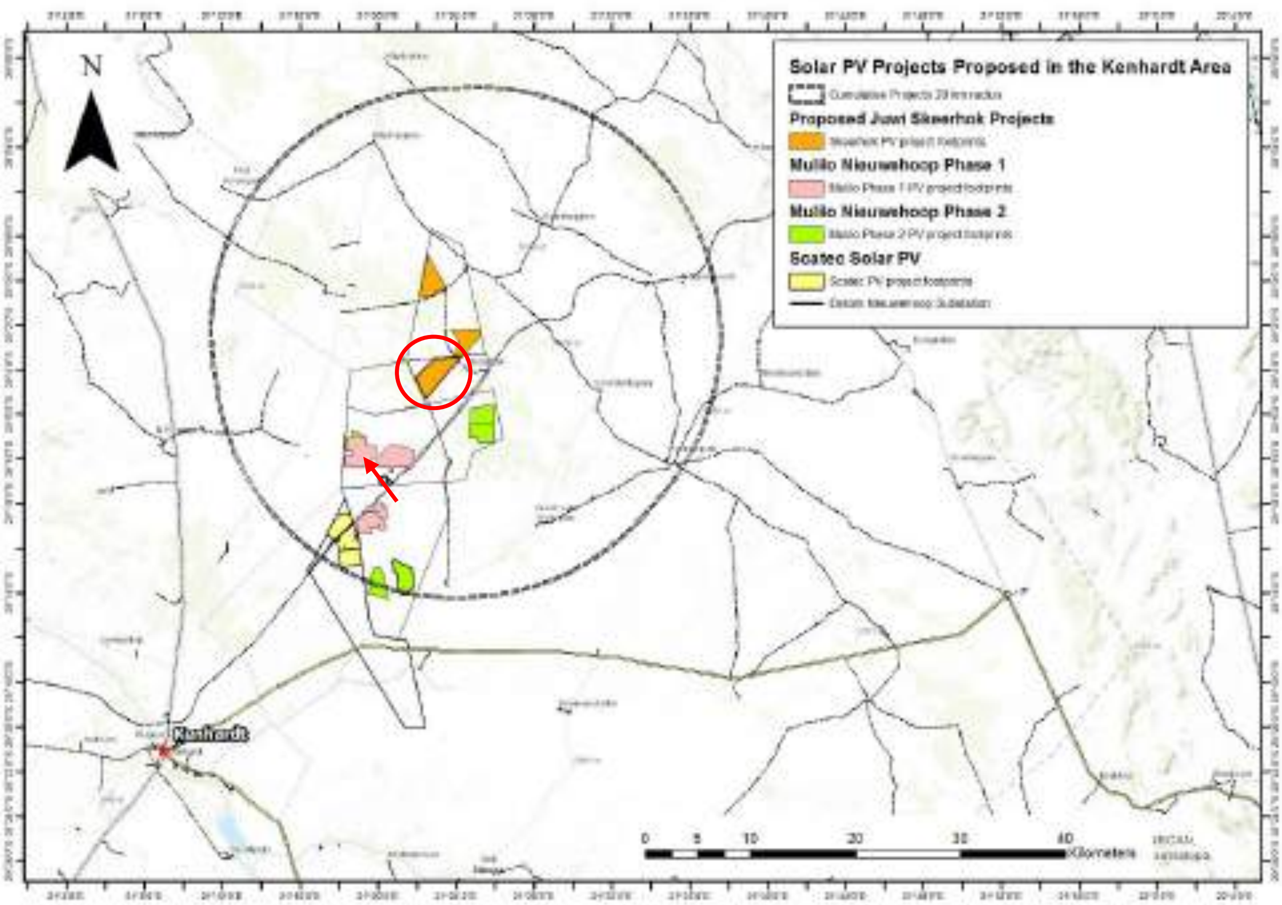

Figure 3: *Map of the broader area around the Nieuwehoop Substation (marked by a red arrow) showing the various solar energy facilities proposed. The present study area is ringed in red.*

3.6. Consultation processes undertaken

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA. Interested and affected parties would have the opportunity to provide comment on the heritage aspects of the project during the PPP.

Although not formal consultation, it is noted that contact was made with a local resident who knew the locations of some rock art sites. These sites were visited with the resident as part of the general background study but, owing to their distance from the study area, they have no direct relevance on the present assessment.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The site is located in a rural area, some 43 km northeast of Kenhardt. However, the Sishen-Saldanha railway line transporting iron ore, its gravel service road, the large, new Eskom Nieuwehoop Substation and some power lines do occur in the general vicinity. The land is otherwise used for grazing of both small stock and wild game.

4.2. Site description

Like much of the broader landscape in this area, the site is very flat. Vegetation consists of grass and low bushes punctuated by occasional taller bushes, especially in ephemeral drainage lines (Figures 4 & 5). Rare quiver trees also occur in the vicinity. The surface is generally sandy, although some igneous bedrock was visible at the surface in places (Figure 6), while calcrete was occasionally noted beneath the surface and revealed in animal burrows. Weathered quartzite occurred as a surface gravel over one fairly large area in the central part of the study area (Figure 7). Rare quiver trees were also seen in the study area (Figure 8).

Figure 4: *View northwards across the site showing typical grass cover as well as taller bushes.*

Figure 5: *View north-eastwards across the site showing typical grass cover as well as taller bushes.*

Figure 6: *View westwards across the site showing an area of exposed igneous bedrock.*

Figure 7: *View northwards across the site showing a heavily weathered quartzite outcrop that has essentially turned to surface gravel.*

Figure 8: *View south-westwards across the site showing one of the few quiver trees noted on site.*

5. ARCHAEOLOGICAL AND HISTORICAL CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey as presented below may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

5.1. Archaeological Aspects

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 often referred to as 'background scatter' and is generally of limited significance (Orton 2016i). At times, however, the scatter can become very dense and mitigation work is occasionally called for. The artefacts located in these contexts are largely Early Stone Age (ESA) and Middle Stone Age (MSA) and date to the middle to late Pleistocene. They are not associated with any other archaeological materials, since these would have long since decomposed and disappeared. Previous experience in the general vicinity suggests that such dense accumulations of background scatter artefacts are unlikely to occur in this part of Bushmanland.

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 have been identified in the broader vicinity in association with pans but artefact scatters associated with drainage lines are rare (Orton 2014a, 2014b, 2014c, 2016b, 2016c, 2016d, 2016e, 2016f, 2016g, 2016h, 2016j, 2016k, 2016l). These sites would typically contain mostly stone artefacts, but fragments of ostrich eggshell (from eggs 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. While no sites have ever been sampled in the vicinity of the present study area, excavations to the northeast of Pofadder at sites adjacent to small water holes demonstrate this pattern well (Orton 2016a). Similar LSA sites can also be found in association with rocky outcrops. Because of their positions along water courses and adjacent to rocky areas, many of these sites get avoided by development proposals because of the need to avoid the relevant natural features. Despite the increased likelihood of locating archaeology along streams, Morris (2009) noted that a search along the banks of the Hartebeest River close to Kenhardt, where he expected elevated frequencies of archaeological material, revealed virtually nothing. This is in contrast to a section of river bank some 42 km south of the present study area along which a dense concentration of LSA and historical sites (including contact sites) was found.

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. Several such occurrences – usually of quartz – have been seen in the general area but these are not significant sites.

A few rock engravings and paintings are known from the broader area (Louw Roux Bushmanland 2013). From the limited information available and from observations made along the Hartebeest River by the present author, the engravings tend to be naturalistic images produced by the Bushmen, while the paintings are geometric images, produced by the Khoekhoen. The latter are not well known from the area (Orton 2013), although examples have been seen in the region (David Morris, pers. comm. 2015; Orton 2016g). Painted art is also very rare but again, examples are known, particularly on large granite boulders like that recorded by Orton (2016g) some 15 km south of the present study area (Figure 9).

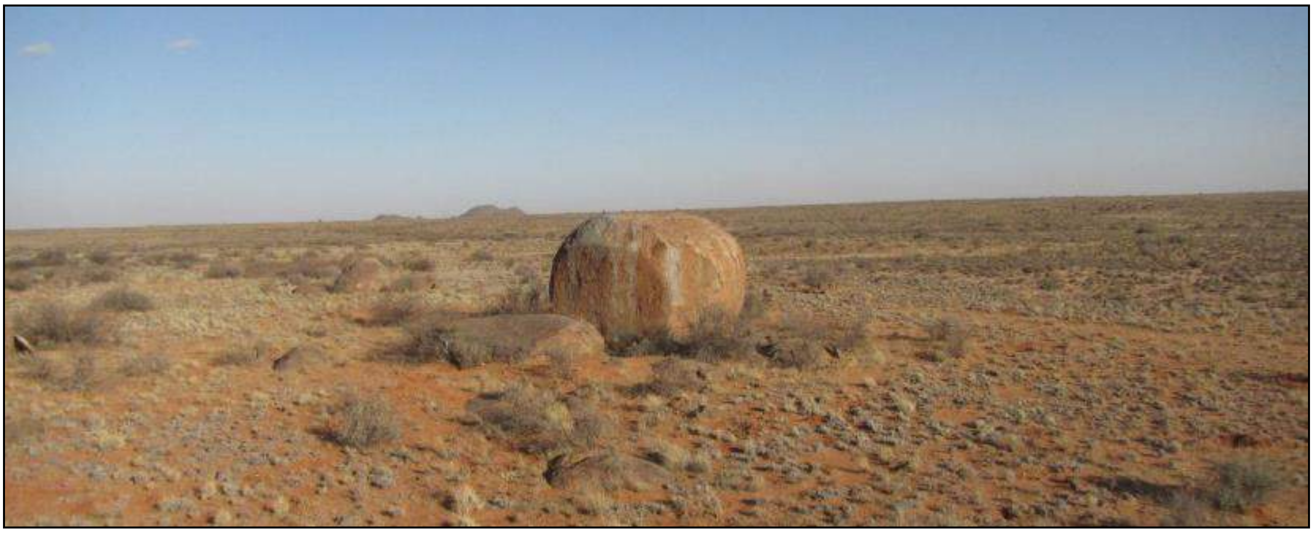

Figure 9: *View of the context of the one painted site known from within the vicinity of the study area. It is evident from the photograph that such contexts are rare in this very flat landscape.*

5.2. Historical Aspects

The Anglo-Boer War was fought across much of the Northern Cape interior, but information on the role of Kenhardt appears difficult to locate. The town was occupied by the Boers in late February 1900 after they convinced the magistrate that they had a large gun and would fire on the town if it did not surrender. They later surrendered to the British who occupied the town on 31st March 1900. By mid-1900 there were perhaps 100 Cape Rebels detained in a camp outside of Kenhardt (Grobler 2004). The British raised a local force known as the Border Scouts in Upington in May 1900. Many were mixed-race individuals, some local farmers, others Kalahari hunters, but all disliked the Boers. The scouts were responsible for a large area of the north-western Cape Colony centred on Upington and Kenhardt. They eventually numbered 786 by January 1901 and were under the command of Major John Birbeck (AngloBoerWar.com 2015; Rodgers 2011). At the beginning of 1902 there were 150 Border Scouts stationed at Kenhardt. Two boers, H.L. Jacobs and A.C. Jooste, were accused of treason and executed in the town on 24 July 1901 (Grobler 2004). A memorial stands there to their honour (Green Kalahari n.d.). Events around Kenhardt were likely not that important and this execution does not even feature in the Boer War timeline provided by Packenham (1993: 291-294).

No major action appears to have taken place around Kenhardt, although the Boers are known to have attacked a patrol on 17th May 1901, while the British attacked a Boer position on 25th June 1901 (AngloBoerWar.com 2015).

From an archaeological point of view the only material remains possibly related to occupation around the time of the Boer War are the series of contact period river bank scatters mentioned above. On one of these was 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 (Orton 2016d).

5.3. Built Environment

The built environment is sparsely represented in rural Bushmanland because the farms tend to be so large. The vast majority of structures appear to be quite recent in age (20th century) and are of very limited heritage significance. In any case, the development will not directly affect any buildings.

5.4. Graves

Graves are also very rare. Some older farm complexes have small graveyards located close to their farm buildings, while suspicious isolated rocks, perhaps planted upright, may mark historical graves of early mobile farmers (the so-called *trek boers*). An example has been seen some 19 km to the southwest (Orton 2016j). Unmarked pre-colonial graves can, in theory, be located anywhere, although they are generally more common in sandy areas where excavation of graves was easier and in more productive areas where population densities would have been higher.

6. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. Table 1 provides a list of those resources recorded, identifying which are within the potential impact zone and which not. Figure 10 maps these finds.

Table 1: *List of findings made during the field survey. Note that sites located more than 30 m from the proposed project footprint are highlighted in grey. Such sites may be within the assessed area or in close proximity to it and could thus still be vulnerable to indirect impacts.*

Waypoint	Co-ordinates	Site name	Description	Significance (Mitigation)
836	S29 03 32.2 E21 23 54.3	GBB2017/001	Light scatter of MSA and LSA artefacts alongside a pan. Materials include quartzite, quartz, hornfels and CCS. The mid-section of a very thin, flat hornfels blade with unifacial flaking was seen. Variable weathering on the artefacts suggests variable age.	Medium-low (2 hours)
906	S29 03 40.1 E21 23 53.9	---	An isolated lower grindstone on dolerite and found face up alongside a very small pan. The background scatter did not appear to be any different or denser here to elsewhere.	Very low.
837	S29 03 42.1 E21 22 49.9	---	Low density scatter of MSA and LSA artefacts alongside a pan. Materials include quartzite, quartz, silcrete, 'other'. Variable weathering on the artefacts suggests variable age.	Low
838	S29 04 12.2 E21 21 56.6	---	Low density scatter of adiagnostic artefacts alongside a pan. Quartz and quartzite were present.	Very low
839	S29 04 13.2 E21 21 58.5	---	Low density scatter of adiagnostic artefacts alongside a pan. Quartz and quartzite were present.	Very low
840	S29 04 19.2 E21 22 01.4	GBB2017/002	Scatter of LSA and some older artefacts alongside a 'mini-pan'. Materials include quartz, quartzite and CCS.	Medium-low (2 hours)
841	S29 04 12.7 E21 22 17.8	GBB2017/003	A gneiss lower grindstone displaying ephemeral use as well as a low density scatter of quartz artefacts. Likely LSA in age.	Low
842	S29 04 18.6 E21 22 30.5	GBB2017/004	An old and quite extensive quartzite outcrop that has weathered to gravel and small blocks.	Very low

843	S29 04 19.5 E21 22 33.3		There are a fair number of quartzite flakes amongst the gravel. It is a greenish-coloured quartzite that I have seen in several places.	
844	S29 04 15.9 E21 22 36.5			

6.1. Archaeology

Archaeological resources were sparsely distributed across the study area with only a few areas found to have artefacts present in any quantity. Most were in the west, away from the development footprint (Figure 10). None of these was of great significance, but two areas revealed sites with some research value; only one lies inside the development footprint though (waypoint 836). There were, however, isolated background scatter artefacts found throughout the study area (Figures 11 & 12). A somewhat denser area of background scatter was located at waypoint 837

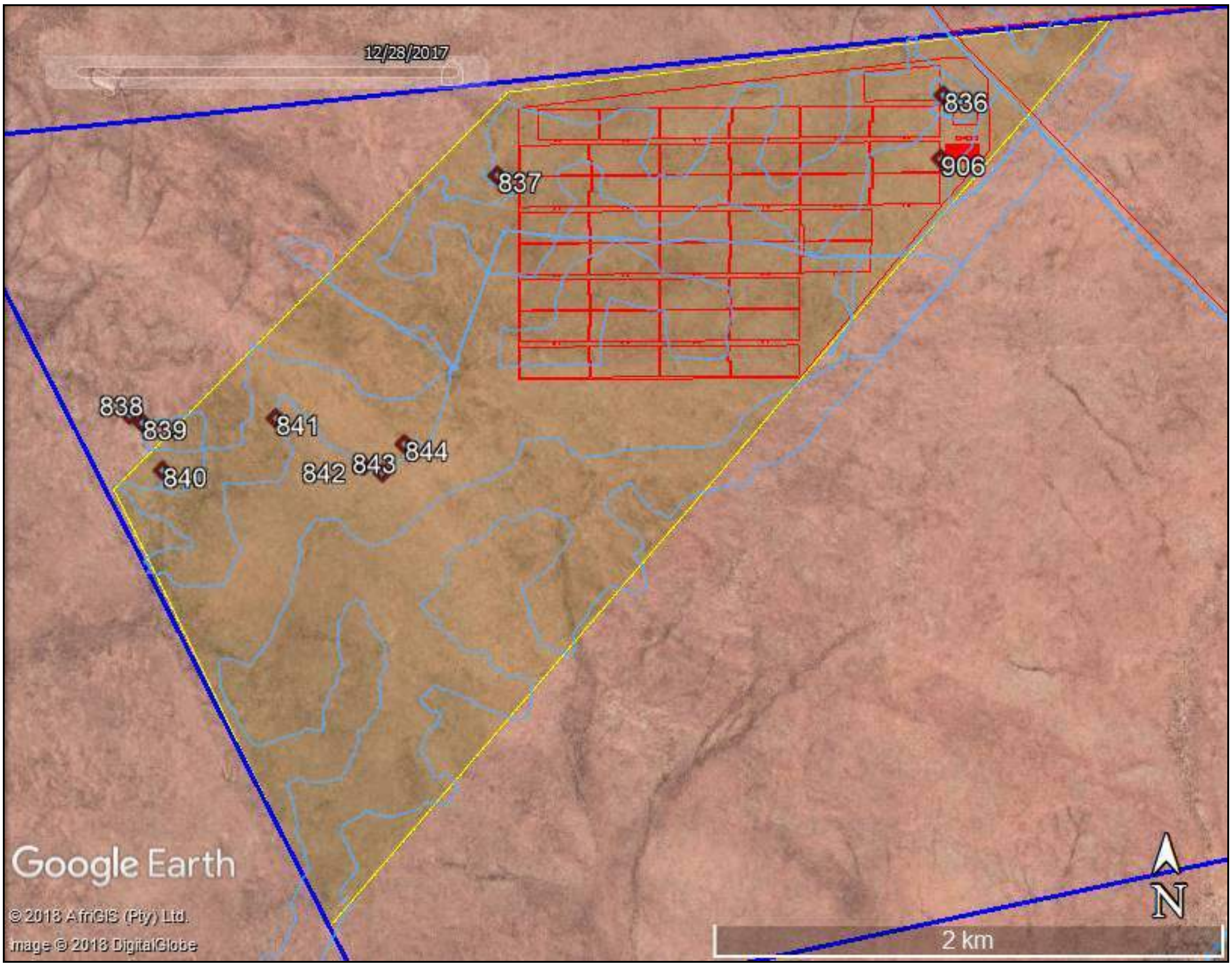

Figure 10: *Map showing the distribution of heritage resources (numbered symbols). The dark blue lines are the northern, western and southern edges of the farm portion, the yellow polygon is the study area, while the red polygons represent the proposed facility layout. Light blue lines denote the survey tracks.*

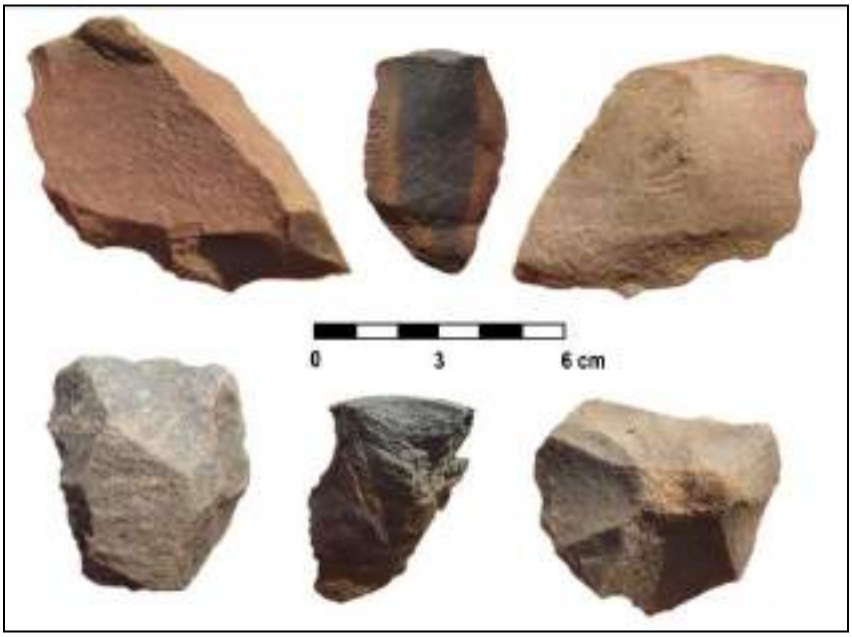

Figure 11: *Examples of isolated background scatter stone artefacts found across the study area. They are likely all MSA artefacts.*

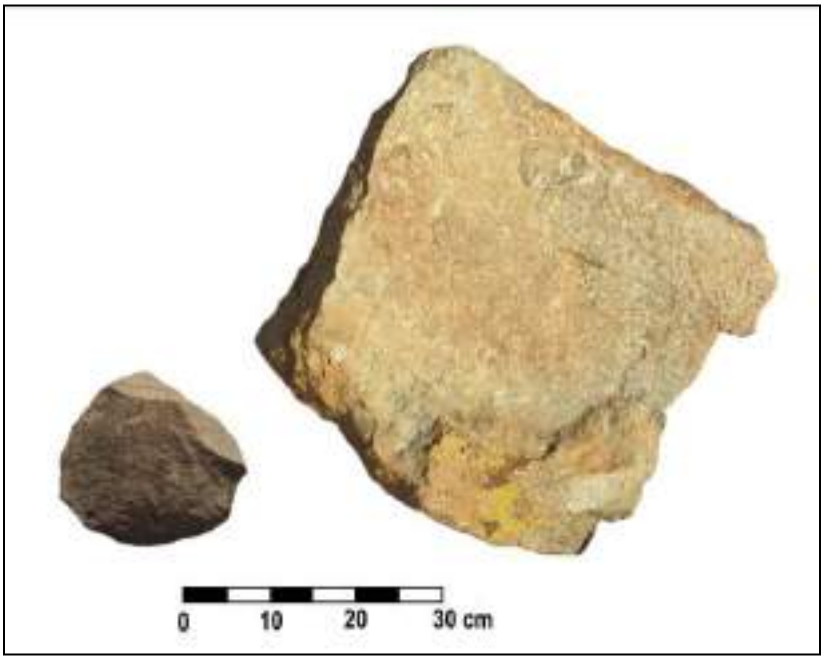

Figure 12: *A very large flake and a broken lower grindstone likely dating to the ESA and LSA respectively. The latter was found at waypoint 841.*

The two sites referred to above were both of fairly low density but had enough spatial integrity to be listed as sites rather than background scatter. Figure 13 shows artefacts from waypoint 836. A very weathered grey-green quartzite outcrop at waypoints 842-844 (Figure 7) provided a material source for flaking and a number of artefacts were seen among the naturally occurring quartzite debris (Figure 14).

Figure 13: *A selection of artefacts from the site at waypoint 836. Scale in cm.*

Figure 14: *A selection of quartzite artefacts from the weathered outcrop at waypoints 842 to 844. Scale in cm.*

Because SAHRA requested that the visual impact on heritage resources be considered, it is pertinent to note that the only visually sensitive archaeological site known to the author in the broader area is a rock art site located 7.5 km south of the footprint area. This is the site on the boulder depicted in Figure 9.

6.2. Palaeontology

Although the SAHRIS Palaeosensitivity Map (Figure 22) shows the study area to be largely of moderate sensitivity, the nature of the area in terms of palaeontology is such that a full palaeontological study was not deemed necessary by the appointed specialist. Nevertheless, because SAHRA had requested an evaluation of the palaeontological impacts, a desktop study was compiled for the greater project and is briefly summarised here.

Figure 22: *Extract from the SAHRIS Palaeosensitivity map showing the study area to be of generally moderate palaeontological sensitivity (green shading) but with some areas regarded as zero sensitivity (grey shading).*

The broader area is underlain by metamorphic rocks that are entirely unfossiliferous. The overlying Late Cenozoic superficial sediments are generally of low palaeontological sensitivity, although small, isolated pockets of high sensitivity can be found when fossils are trapped within alluvium related to pans and river terraces along larger water courses (Almond 2017).

Almond (2017) has listed the possible fossils that might be found in the area, although he notes that none have been found there to date. Isolated bones and teeth (e.g. of mammals, fish, amphibians), ostrich eggshell fragments, freshwater molluscs, crabs, trace fossils (e.g. burrows), petrified wood, stromatolites, diatoms and pollen are all possible finds but deemed highly unlikely.

6.3. Graves

No graves were found within the study area, although this does not rule out the possibility that graves could occur due to the great difficulty in spotting them, or at least the stone 'features' thought to be graves.

6.4. Built environment

No built environment features were found within the study area. No structures were visible from the study area with the nearest house being 1.5 km to the southeast of the PV layout area. This is the landowner's residence. The structures are 20th century in age and are of low significance. Only one structure was present in 1945 (Figure 23). It was not visited during the field assessment. The farm complex would not be affected in any way, although one of the access road alternatives passes about 130 m north of the complex.

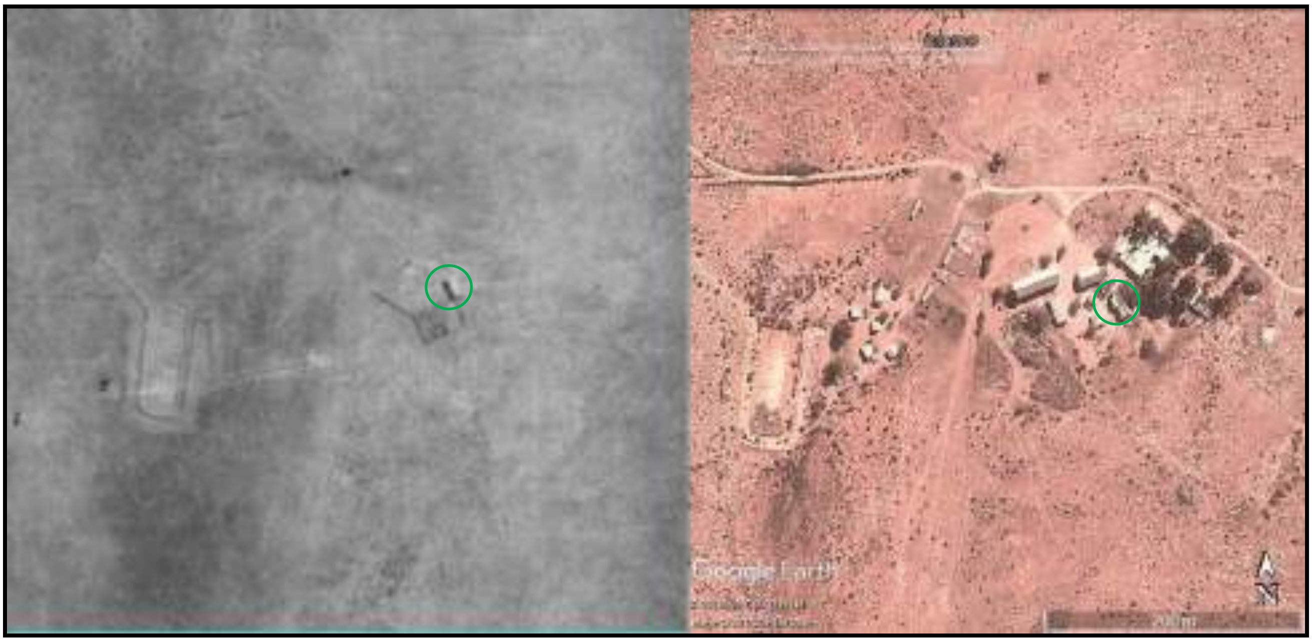

Figure 23: *Aerial views of the Skeerhok Farm Complex dating to 1945 (Job 083, strip 4, photograph 02372) and 2013 (Google Earth). The only structure present in 1945 is ringed in green in both images.*

6.5. Cultural landscape and visual concerns

The cultural and natural landscape is also of concern. However, the cultural landscape is very poorly developed in this area with fences, water troughs and wind pumps being the primary anthropogenic features. The primary sense of place is one of remoteness rather than of a farming landscape. This remoteness has already been impacted upon by the presence of the railway line, Nieuwehoop Substation and all associated power lines. The natural landscape lacks visually interesting and sensitive features. In addition, the proposed site is a long distance from any important roads (it is 23 km from the R27) and is highly unlikely to be visible to anyone other than local residents making use of the gravel road along the railway line. Solar PV facilities are not very tall and, if an earthy coloured paint is used for the buildings where feasible, they can be almost invisible from as little as 1 km away.

A pan 6.5 km northeast of the study area was cultivated during the mid-20th century (Figure 24). This shows the low intensity, opportunistic subsistence agriculture practiced in a pan when sufficient rain had fallen. All other activities in the broader area relate to small stock grazing.

It is notable that the landscape in the vicinity of the study area already has an electrical layer comprised of a large substation and several power lines (Figure 25). It is because of the substation that the development location has been chosen.

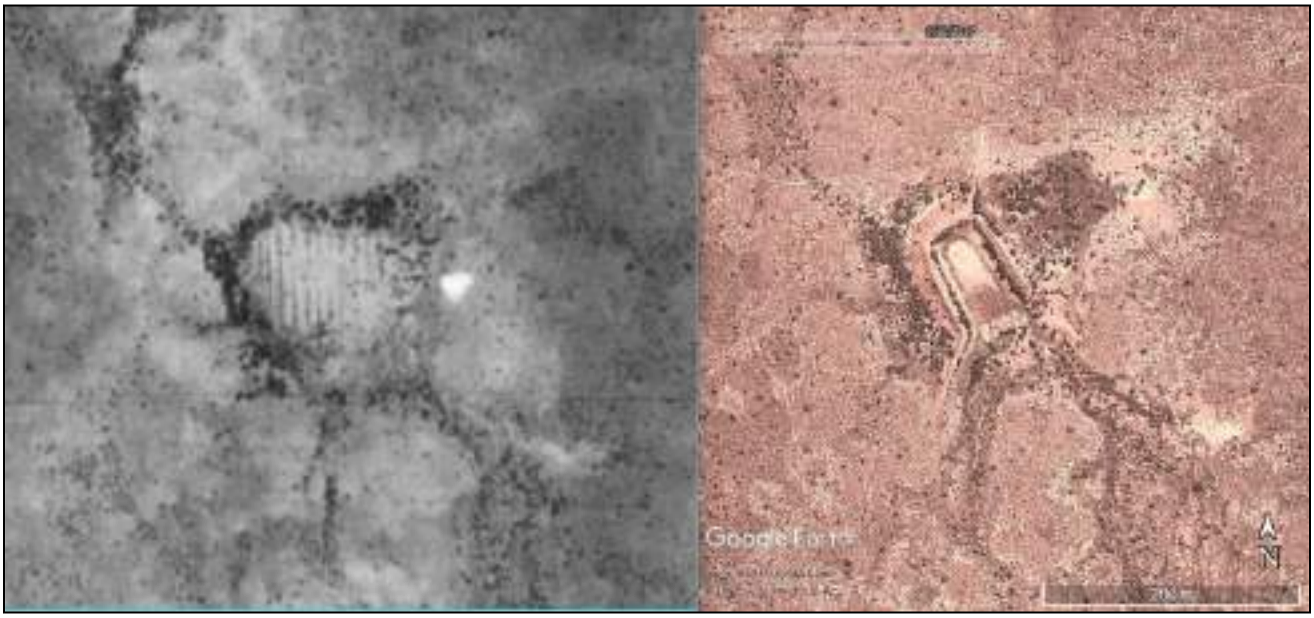

Figure 24: *1944 (Job 83, strip 001, photograph 02633) and modern (Google Earth) aerial photographs showing the pan to have been under cultivation during the mid-20th century but excavated out to facilitate water catchment by the late 20th century.*

Figure 25: *Evening view of the large Eskom substation located some 16 km south of the proposed project.*

6.6. Summary of heritage indicators

The primary indicator of concern here is archaeological sites. Although no highly significant sites were located within the proposed development footprint, the chance still exists that one could occur there and be damaged or destroyed by the proposed development. The survey has ensured, however, that no large and potentially highly significant sites would be impacted. Graves could also occur, but again, the chances are small. The chances of impacting on significant palaeontological resources are considered minimal. The single visually sensitive heritage site in the area, a rock art site, is located well far enough away to be of no concern here. The only other issue is visual impacts to the cultural landscape but this issue is unavoidable and of little heritage concern.

6.7. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

The archaeological resources within the development footprint are deemed to have low cultural significance for their scientific value (provisional grade: General Protection B).

Graves are deemed to have high cultural significance for their social value, but none have been located within the site to date. Any graves present would be assigned a grading of IIIA.

The cultural landscape is of fairly low significance because it is extensive and quite monotonous. This makes it fairly well-suited to the proposed development because there are no strong cultural features to it that would be irreversibly harmed by it. Furthermore, there is an electrical layer already present with the potential for this to be expanded.

7. ISSUES, RISKS AND IMPACTS

7.1. Summary of issues identified during the Scoping Phase

The main heritage issues identified during the scoping phase were:

- The potential damage to or destruction of archaeological sites;
- The potential damage to or destruction of palaeontological materials; and
- The potential visual or contextual impacts to the cultural landscape.

On submission of the scoping report to SAHRA, they responded as follows:

> *SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes that a Heritage Scoping Input has been submitted, and therefore awaits the pending Heritage Impact Assessment (HIA) as part of the draft EIA Phase.*
>
> *The pending HIA must assess all heritage resources as defined in section 3(2) of the National Heritage Resources Act, Act 25 of 1999 (NHRA) and the report must comply with section 38(3) of the NHRA. The Archaeological and Palaeontological components of the HIA must comply with the SAHRA 2006 Minimum Standards for Archaeological and Palaeontological Components of Impact Assessments and the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Additionally, the Visual Impact of the proposed development on heritage resources and any comments provided by the public regarding heritage resources must be taken into consideration. The Scoping report appendices, the draft EIA with all appendices must be submitted along with the heritage reports in order for further comments to be issued.*

The present HIA meets the requirements of SAHRA in that it assesses all relevant aspects of heritage and aims to satisfy Section 38(3) of the NHRA. The archaeological and palaeontological components have been prepared by specialists, while visual impacts to heritage resources are also considered (note that a separate visual impact assessment is also available as part of the overall EIA). No other heritage-related comments were received during the public participation process (PPP) for the scoping report.

7.2. Identification of potential impacts/risks

Based on both fieldwork and desktop research as well as the concerns of SAHRA, the potential heritage-related impacts identified during the EIA assessment are:

Construction Phase
- Potential direct impacts to archaeological resources
- Potential direct impact to palaeontological resources
- Potential direct impacts to graves
- Potential direct and visual impacts to the cultural landscape
- Potential visual impacts to all visually sensitive heritage resources

Operational Phase
- Potential direct and visual impacts to the cultural landscape
- Potential visual impacts to all visually sensitive heritage resources

Decommissioning Phase
- Potential direct and visual impacts to the cultural landscape
- Potential visual impacts to all visually sensitive heritage resources

Cumulative impacts
- Potential direct impacts to archaeological resources
- Potential direct impact to palaeontological resources
- Potential direct impacts to graves
- Potential direct and visual impacts to the cultural landscape
- Potential visual impacts to all visually sensitive heritage resources

8. IMPACT ASSESSMENT

Note that although SAHRA identified the need to assess the impacts to visually sensitive heritage resources, none were found to occur within the study area or near enough to be of any concern. This aspect is thus not considered further in this section although impacts to the cultural landscape are visual in nature and are assessed.

Note also that linear aspects such as the water pipeline and access road are subsumed within the assessments below because the level of impacts expected would at all times be less than or equal to that for the PV facility. Furthermore, these alignments were not surveyed in the field because their locations were only available during the impact assessment phase of the project.

8.1. Direct Impacts

8.1.1. Construction Phase

Construction phase impacts are assessed in Table 2.

Potential impacts to archaeology

Archaeological resources are sparsely distributed on the landscape with important sites being rare. Nevertheless, direct impacts in the form of destruction of or damage to sites and materials may occur if construction machinery operates outside of the demarcated areas, if the single site worthy of further research is not mitigated, or if further as yet undiscovered archaeological sites are present. Because of the high likelihood of damaging significant archaeological resources in the proposed development footprint (one such site does occur in the footprint), the overall impacts to archaeology are expected to be moderate before mitigation. Potential mitigation measures include conducting a final footprint survey and then excavating or sampling any important archaeological material found to occur within the footprint including the already known site. The chances of further such material being found, however, are considered to be very small. After mitigation, the overall impact significance would likely be very low.

Potential impacts to palaeontology

The desktop study showed that the probability of finding and damaging or destroying significant palaeontological material during development is extremely unlikely. As such, the potential impacts to palaeontology are considered to be very low. The only measure that needs to be put in place is to ensure that the environmental control officer is alerted if any fossil material is found and that such material gets reported to SAHRA. A palaeontologist may need to inspect the find or conduct further research. The impact significance after mitigation remains very low.

Potential impacts to graves

The probability of uncovering graves during construction is extremely unlikely. Despite their importance, the significance of potential impacts to graves is thus assessed to be very low. Mitigation in the event that a grave was found would include following the appropriate exhumation process that should include a public consultation process if the grave is suspected to be historical. The impact significance after mitigation remains very low.

Potential impacts to the cultural landscape

Although impacts to the cultural landscape, in the form of the addition of features not considered generally compatible with a rural landscape, would definitely occur, the very limited heritage significance of this landscape and the current existence of a large substation and power lines means that the consequence is only seen as moderate. Although minimising the surface footprint and the amount of white structures visible would reduce impacts, they are considered to be of low significance both before and after mitigation.

8.1.2. Operation Phase

Operation phase impacts are assessed in Table 3. Because no changes to the substrate are expected during operation, impacts relate solely to the presence of the facility in the landscape.

Potential impacts to the cultural landscape

Although impacts would definitely occur if the facility is constructed, because the cultural landscape is only weakly developed and of low heritage significance, the overall impact significance is rated as being low. The only reason they are not seen as very low is because of the long duration over which the impact would occur. After construction there is nothing that can be done by way of mitigation measures to further reduce impacts so no change to the significance assessment is required.

8.1.3. Decommissioning Phase

Decommissioning phase impacts are assessed in Table 4. Because no changes to undisturbed substrate are expected during decommissioning, impacts relate solely to the removal of the facility from the landscape and the subsequent rehabilitation period.

Potential impacts to the cultural landscape

The visual impact of the proposed solar energy facility would remain static until decommissioning. At this time, however, there would be an increased visual impact due to the equipment brought onto site to dismantle the plant and the rehabilitation work which would result in much dust. These impacts would, however, be temporary. After the decommissioning is complete, the landscape would then also be scarred but allowed to recover with time. The cleared but scarred landscape would result in less impacts than the actual dismantling of the plant so the assessment in Table 4 reflects the dismantling activities. While minimising the time taken to effect the decommissioning and employing dust suppression measures are appropriate mitigation measures, they are unlikely to result in any change in significance to the impact ratings. The impacts are deemed to be of low significance.

8.1.4. Cumulative impacts

Cumulative phase impacts are assessed in Table 5. They are effectively all the same impacts as would be experienced during the construction phase of the proposed project.

Potential impacts to archaeology

Archaeological resources are sparsely distributed on the wider landscape with important sites being rare. Nevertheless, direct impacts in the form of destruction of or damage to sites and materials may occur at any of the proposed facilities in the area, especially if construction machinery operates outside of the demarcated areas or if further as yet undiscovered archaeological sites are present. Because of the low likelihood of finding further significant archaeological resources in the relevant areas proposed for development and the generally low density of sites in the wider landscape the overall impacts to archaeology are expected to be of low significance before mitigation, even though one site of low-medium heritage significance does occur within the present project footprint. Potential mitigation measures include conducting final footprint surveys and then excavating or sampling any important archaeological material found to occur within the footprints, including the already known site affected by the present project. The chances of further such material being found, however, are considered to be small, even across multiple development areas. After mitigation, the overall impact significance would likely be very low. It is considered unlikely that the cumulative impacts to archaeological resources would differ if six or fourteen solar energy facilities were constructed in the area.

Potential impacts to palaeontology

The desktop study showed that the probability of finding and damaging or destroying significant palaeontological material during the constriction of renewable energy facilities in this area is extremely unlikely. Areas in and along water course tend to be of slightly higher sensitivity but such areas are routinely avoided anyway during the formulation of development proposals. As such, the potential impacts to palaeontology are considered to be very low. The only measure that generally needs to be put in place is to ensure that the environmental control officer is alerted if any fossil material is found and that such material gets reported to SAHRA. A palaeontologist may need to inspect the find or conduct further research. The impact significance after mitigation remains very low. It is considered unlikely that the cumulative impacts to palaeontological resources would differ if six or fourteen solar energy facilities were constructed in the area.

Potential impacts to graves

The probability of uncovering graves during construction anywhere in the surrounding landscape is extremely unlikely. Despite their importance, the significance of potential impacts to graves is thus assessed to be very low. Mitigation in the event that a grave was found would include following the appropriate exhumation process that should include a public consultation process if the grave is suspected to be historical. The impact significance after mitigation remains very low. It is considered unlikely that the cumulative impacts to archaeological resources would differ much if six or fourteen solar energy facilities were constructed in the area. Given the difficulty in identifying graves, there is a small chance that a slightly greater impact could be experienced if fourteen facilities are built.

Potential impacts to the cultural landscape

Although impacts to the cultural landscape, in the form of the addition of features not considered generally compatible with a rural landscape, would definitely occur, the very limited heritage significance of this landscape means that the consequence is only seen as moderate. Although minimising the surface footprint and the amount of white structures visible would reduce impacts, they are considered to be of low significance both before and after mitigation. It is considered unlikely that the cumulative impacts to the cultural landscape would differ much if six or fourteen solar energy facilities were constructed in the area. This is mainly due to the quite isolated location of the Nieuwehoop Substation and the various projects proposed around it.

8.2. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many vantage points is undesirable. Because of the height of the majority of the proposed development, such an impact is not envisaged.

Table 2: 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 impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
Clearing of site and excavation of foundations and construction of the facility	**Loss of / damage to archaeological sites**	Negative	Site	Permanent	Severe	Very likely	Non-reversible	High	Final footprint survey, excavation if needed	Moderate	Very low	5	High
	Loss of / damage to palaeontological materials	Negative	Site	Permanent	Severe	Extremely unlikely	Non-reversible	High	Chance finds procedure	Very low	Very low	5	High
	Loss of / damage to graves	Negative	Site	Permanent	Extreme	Extremely unlikely	Non-reversible	High	Exhumation process	Very low	Very low	5	Medium
	Impacts to the cultural landscape	Negative	Local	Short term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	Minimise footprint, minimise white-painted surfaces	Low	Low	4	High

Table 3: Impact assessment summary table – Operation 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 impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
Presence of the solar energy facility on the landscape and occasional access by maintenance vehicles	**Impacts to the cultural landscape**	Negative	Local	Long term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	None	Low	Low	4	High

Table 4: Impact assessment summary table – 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 impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
Presence of the solar energy facility on the landscape, frequent access by construction vehicles, creation of dust and landscape scarring	**Impacts to the cultural landscape**	Negative	Local	Short term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	Minimise work time, Use dust suppression measures	Low	Low	4	High

Table 5: 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 impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
Clearing of sites, excavation of foundations and construction of the facilities	**Loss of / damage to archaeological sites**	Negative	Site	Permanent	Severe	Very unlikely	Non-reversible	High	Final footprint survey, excavation if needed	Low	Very low	5	High
	Loss of / damage to palaeontological materials	Negative	Site	Permanent	Severe	Extremely unlikely	Non-reversible	High	Chance finds procedure	Very low	Very low	5	High
	Loss of / damage to graves	Negative	Site	Permanent	Extreme	Extremely unlikely	Non-reversible	High	Exhumation process	Very low	Very low	5	Medium
	Impacts to the cultural landscape	Negative	Local	Short term	Moderate	Very likely	High (rehabilitation after decommissioning)	High	Minimise footprint, minimise white-painted surfaces	Low	Low	4	High

9. LEGISLATIVE AND PERMIT REQUIREMENTS

Once Environmental Authorisation has been granted there are no further legal requirements that the developer has to meet so long as all conditions stipulated by the heritage authority have been complied with. If there is any archaeological mitigation work to be carried out then the appointed archaeologist would need to apply for and be granted a permit to allow them to carry out the work. This permit would be issued in the name of the archaeologist and it remains their responsibility to ensure that they have met the requirements that may be imposed on them as conditions on the permit. The permit application process allows the heritage authorities to ensure that a suitably qualified and experienced archaeologist undertakes the work and that the proposed excavation/sampling methodology is acceptable. The final comment issued by the heritage authority in response to the permit report would, however, still be needed by the developer to prove compliance with the heritage-related authorisation conditions.

In the event of any archaeological or palaeontological material or graves being exposed during construction it may be necessary for a specialist to apply for a permit as described above in order to effect rescue of the relevant material.

10. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

The EMPr should include all mitigation and management actions suggested in this report as well as make provision for further actions that may become necessary after a final 'walkdown' survey of the various project component footprints. Monitoring would entail the ECO ensuring that any protected sites remain undisturbed throughout the duration of the construction period.

10.1. Mitigation requirements

At this point there is just one archaeological site that would require mitigation prior to construction because it falls within the proposed development footprint and will very likely not be avoidable (Figure 26). No other significant sites were located within the project footprint. However, because it was not practical to conduct a comprehensive survey of the entire study area and the linear feature layouts were not available for field study, it is suggested that a pre-construction walk down survey be carried out during the design phase. The ECO will need to ensure that this survey is commissioned at least 6 months in advance of construction in order to allow for the mitigation process to be carried out as necessary.

10.2. Monitoring requirements

At this point there are no significant archaeological sites that would require *in situ* conservation during development. This means that no specific monitoring requirements can be posed. However, whenever the ECO is on site they should be aware of any potential heritage material that may still be undiscovered. Graves are the main potential issue here. Any such material found would require immediate *in situ* preservation and reporting to SAHRA.

Although the chances of locating palaeontological material are extremely small, the ECO should make staff aware of this possibility and ensure that a reporting procedure is followed. The 'Chance

Fossil Finds Procedure' include in the palaeontological specialist study (see Appendix 2) should be followed.

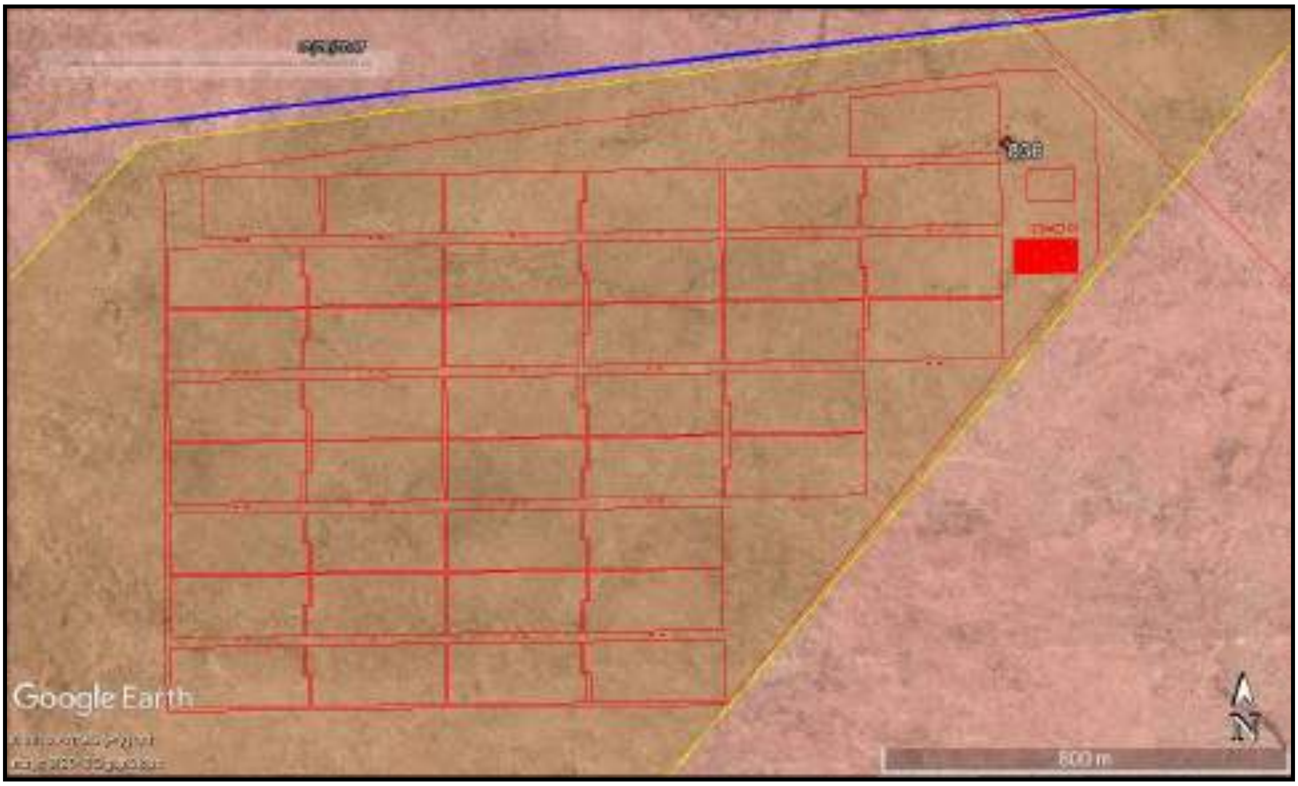

Figure 26: *Aerial view of the proposed development footprint (red outlines) showing the single heritage site requiring mitigation (waypoint 836). This is site GBB2017/001.*

11. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The provision of electricity is important to South Africa in terms of both growing the economy to provide jobs and providing electricity to households. Because no highly significant heritage resources would be impacted by the proposed development it is considered that the social and economic benefits outweigh any minor impacts to heritage, including those to the known site of low-medium heritage significance.

12. CONSULTATION WITH HERITAGE CONSERVATION BODIES

No formal consultation was carried out as part of this HIA because the report would be part of the legislated public participation process (PPP) that will be carried out as part of the EIA (see section 3.6 above).

13. CONCLUSIONS

Only one significant heritage resource has been identified in the vicinity of the proposed solar energy development. This is an archaeological site associated with a pan that has in the past been excavated deeper to improve its water catchment ability (Figure 25). The excavation has revealed ESA, MSA and LSA stone artefacts from beneath the surface of the pan. This site will need *in situ* conservation. Aside from this site, so long as a final walk down survey is carried out there are no reasons to prevent development of this site from proceeding. There is no favoured alternative in terms of access roads.

14. RECOMMENDATIONS

Because no highly significant impacts to heritage resources are envisaged, it is recommended that planning and construction of the proposed Skeerhok PV2 solar energy facility should be authorised but subject to the following conditions which should be incorporated into the Environmental Authorisation:

- The archaeological site at waypoint 836 (GBB2017/001) must be sampled if it cannot be avoided;
- Fencing around the facility is to be visually permeable;
- The use of white paint on structures should be minimised with earthy tones favoured;
- The archaeological site at SHK2017/003 should be cordoned off and all access to it prevented;
- A final archaeological walk down survey of both the facility footprint and any associated linear features must be carried out at least six months in advance of construction;
- Staff must be made aware of the small possibility of locating buried fossils and should this occur they must be left in place and immediately reported to the ECO and/or the heritage authorities; and
- If any 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.

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address:	40 Brassie Street, Lakeside, 7945
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Cell Phone:	083 272 3225
Email:	jayson@asha-consulting.co.za

Birth date and place:	22 June 1976, Cape Town, South Africa
Citizenship:	South African
ID no:	760622 522 4085
Driver's License:	Code 08
Marital Status:	Married to Carol Orton

Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science) 1997	
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP) membership number: 43

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member	2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member	2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

- Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Desktop-based Letter of Exemption (for the South African Heritage Resources Agency)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 archaeological test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
  - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

Western Cape Government Cultural Affairs Awards 2015/2016: Best Heritage Project.

APPENDIX 2 – Palaeontological study

PALAEONTOLOGICAL HERITAGE DESKTOP INPUT:

Kenhardt PV Solar Energy Facility, Farms Gemsbok Bult 120 and 120/9 near Kenhardt, Northern Cape and associated powerline to the existing Nieuwehoop Substation

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December 2017

1. GEOLOGICAL CONTEXT

The study area for the proposed Kenhardt PV Solar Energy Facility on Gemsbok Bult Farm 120 and Farm 120/9, located some 40 km northeast of Kenhardt, is situated at an elevation of *c*. 1000 m amsl. in semi-arid, flat-lying terrain of the Bushmanland region of the Northern Cape (Northern Cape Pan Veld geomorphic region of Partridge *et al.* 2010). The region is drained by a dendritic network of shallow, southwesterly-flowing tributary streams of the Hartbeesrivier such as the Rugseersrivier and other unnamed drainage lines. The geology of the study area is shown on adjoining 1: 250 000 geology sheets 2920 Kenhardt and 2820 Upington (Council for Geoscience, Pretoria) (Figure 1). The entire area is underlain at depth by a variety of Precambrian basement rocks that are *c*. 2 billion years old and are assigned to the **Namaqua-Natal Province**. These ancient igneous and high-grade metamorphic rocks - mainly granites and gneisses of the **Keimoes Suite** (granitoids) *plus* high grade metasediments of the **Jacobmynspan Group** (*e.g.* gneisses of the **Sandnoute Formation**) – are listed in the legend to Figure 1. The various basement rock units are described in the Kenhardt and Upington 1: 250 000 sheet explanations by Slabbert *et al.* (1999) and Moen (2007) respectively and are placed in the context of the Namaqua-Natal Province by Cornell *et al.* (2006). They generally crop out as scattered, low surface exposures rather than elevated *koppies*. The Precambrian crustal rocks are transected by the NW-SE trending Boven Rugzeer Shear Zone which trends NW-SE to the southwest of the core solar development study area and will be transected by the associated powerline connection to Nieuwehoop Substation (Figure 2). The shear zone is a band of large-scale tectonic deformation which separates two major crustal blocks in Bushmanland known as the Kakamas Terrane and Areachap Terrane (Cornell *et al.* 2006, their fig. 18).

A large proportion of the basement rock outcrop in the PV Solar Energy Facility project area is 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 as well as – especially – Quaternary to Recent aeolian (wind-blown) sands of the **Gordonia Formation** (**Kalahari Group**). 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 were previously considered to range in age from the Late Pliocene/Early Pleistocene to Recent, dated in part from enclosed Middle to Late Stone Age stone artefacts (Dingle *et al*., 1983, p. 291). Following the recent extension of the Pliocene - Pleistocene boundary from 1.8 Ma back to 2.588 Ma the older Gordonia Formation sands are now dated to 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 also perhaps by calcretes of Pleistocene or younger age.

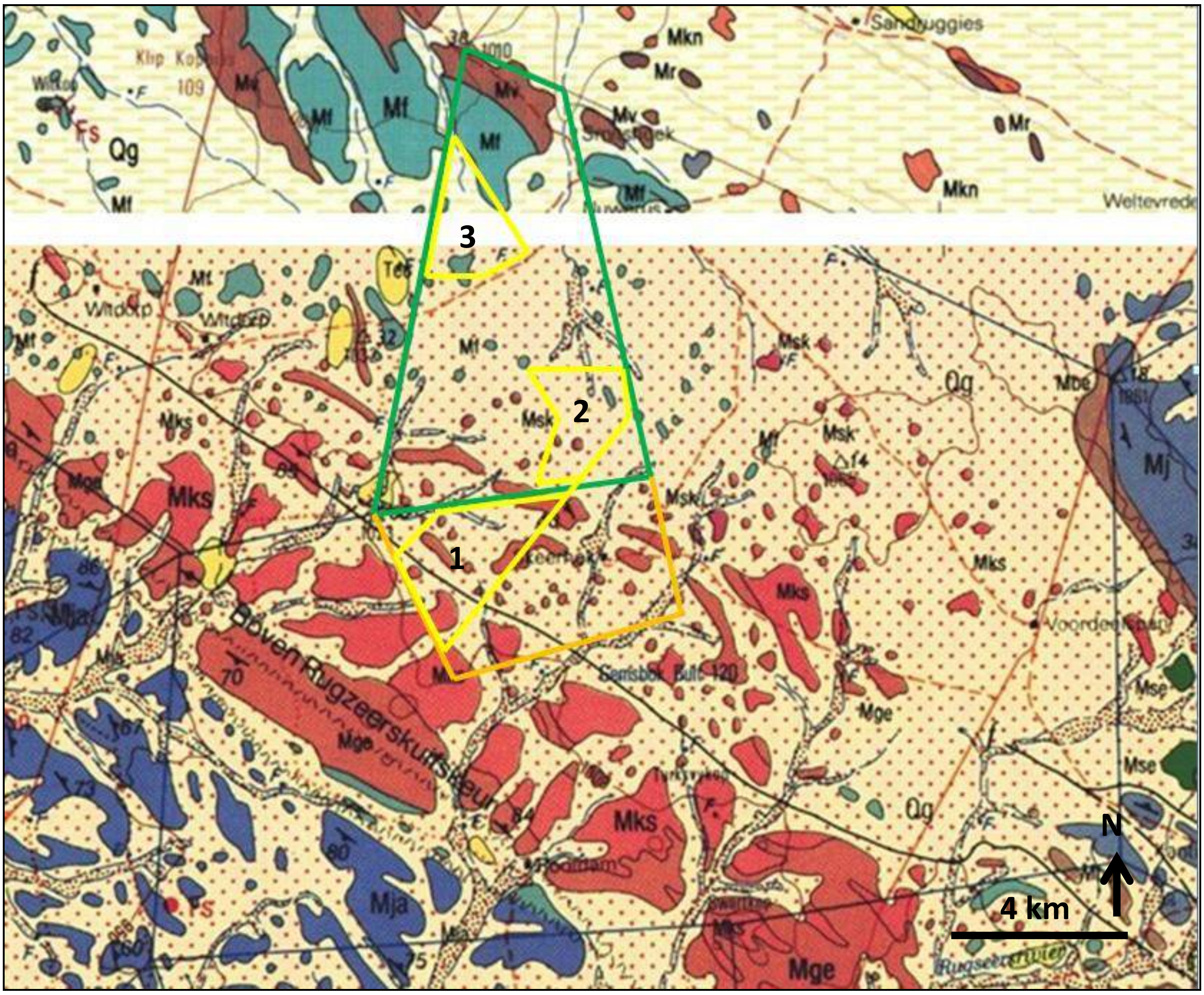

Figure 1. Extract from adjoining 1: 250 000 scale geological map sheets 2920 Kenhardt (below) and 2820 Upington (above) (Council for Geoscience, Pretoria) showing the geology of the Kenhardt PV Solar Energy Facility study area on Gemsbok Bult 120 (green polygon) and Gemsbok Bult 120/9 (orange polygon), situated *c*. 40 km to the NE of Kenhardt, Northern Cape. The three solar development areas under consideration (1, 2 and 3) are indicated by the small yellow polygons. The main geological units represented within the broader project area include:

PRECAMBRIAN BASEMENT ROCKS

KEIMOES SUITE

- **Brown (Mge) = Gemsbokbult Granite**

- Dark brown (Mv) = Vaalputs Granite
- Red (Mks) = Klipkoppies Granite
- Red (Msk) = Skierhoek Granite
- Blue-grey (Mf) =Friersdale Charnockite

  JACOBMYNS PAN GROUP
- Dark blue (Mja) = Jacobmyns Pan Group

LATE CAENOZOIC SUPERFICIAL SEDIMENTS

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

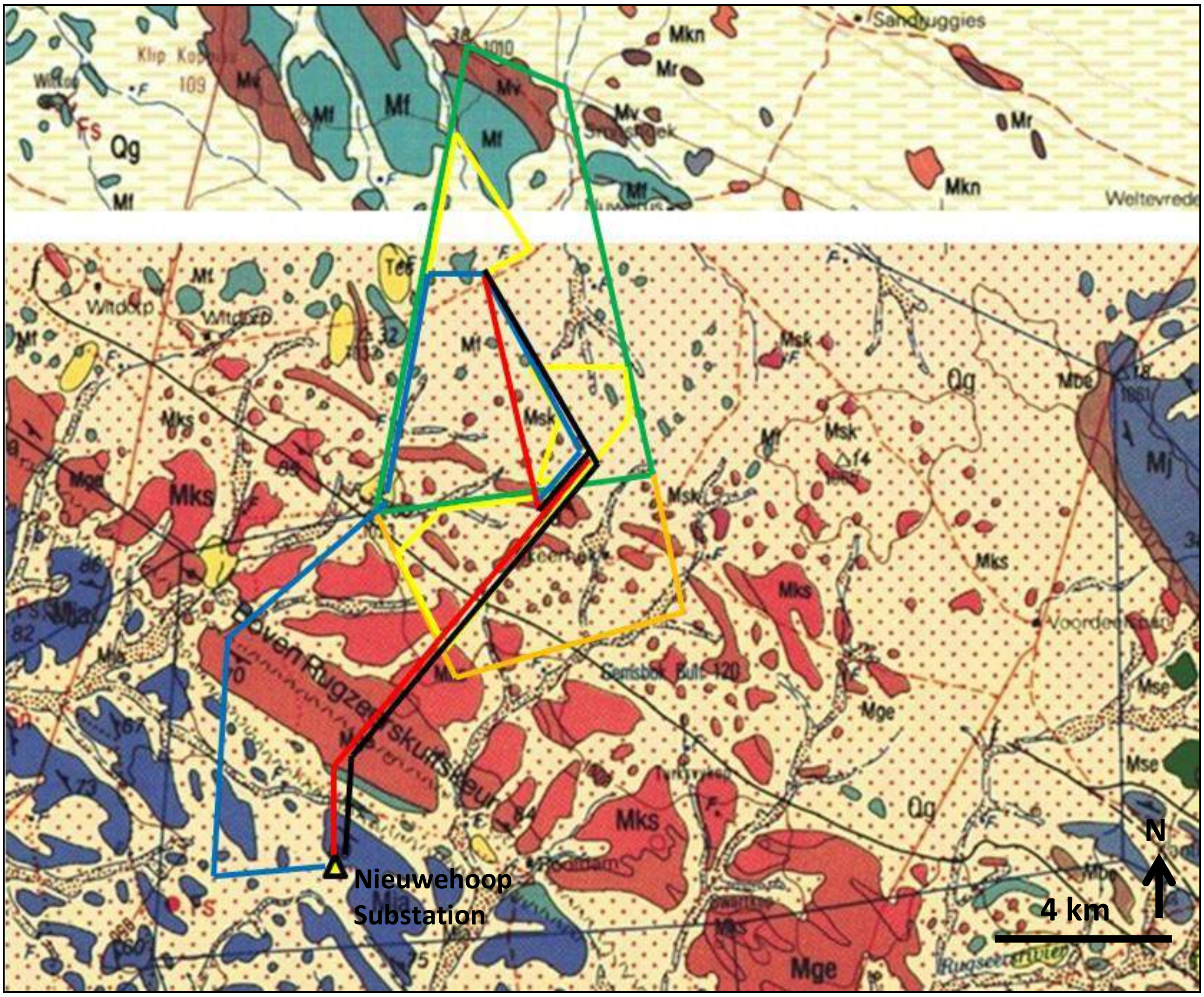

Figure 2. Extract from adjoining 1: 250 000 scale geological map sheets 2920 Kenhardt (below) and 2820 Upington (above) (Council for Geoscience, Pretoria) showing the geology of the study areas for the three power line route options (1- black; 2 – red; 3 – blue) between the Kenhardt PV solar development areas and the existing Nieuwehoop Substation. See legend to Figure 1 for a list of the relevant rock units.

2. PALAEONTOLOGICAL HERITAGE

The Precambrian basement rocks of the **Namaqua-Natal Province** represented within the study area are igneous and high grade metamorphic rocks that were last metamorphosed some 1 billion years ago and are entirely unfossiliferous.

The fossil record of the **Kalahari Group** as a whole is generally sparse and low in diversity; no fossils are recorded here in the Kenhardt and Upington geology sheet explanations by Slabbert *et al.* (1999) and Moen (2007). The Gordonia Formation dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation. However, mummification of soft tissues may play a role here and migrating lime-rich groundwaters derived from underlying lime-rich bedrocks may lead to the rapid calcretisation of organic structures such as burrows and root casts. Occasional terrestrial fossil remains that might be expected within this unit include calcretized rhizoliths (root casts) and termitaria (*e.g. Hodotermes*, the harvester termite), ostrich egg shells (*Struthio*), tortoise remains and shells of land snails (*e.g. Trigonephrus*) (Almond in Macey *et al.* 2011, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g. Corbula, Unio*), ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands. These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the Gordonia Formation is therefore considered to be low. Underlying calcretes might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings) may be occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient alluvial gravels. The younger (Pleistocene to Recent) fluvial and alluvial sands and gravels within the proposed development area are unlikely to contain many, if any, substantial fossil or subfossil remains.

It is concluded that both the Precambrian bedrocks and the Late Caenozoic superficial sediments underlying the study area are generally of ZERO to LOW palaeontological sensitivity, although isolated, and largely unpredictable, pockets of high sensitivity (*e.g.* mammalian remains) may occur sporadically (Table 1). Note that, to the author's knowledge, there are no fossil records from the broader Kenhardt PV Solar Energy Facili**ty** project area itself and no palaeontological fieldwork has been undertaken here.

Table 1: Fossil heritage recorded from the major rock units that are represented within the PV Solar Energy Facility 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 large old river courses)**
Basement granites and gneisses **NAMAQUA-NATAL PROVINCE**	**Highly-metamorphosed sediments, intrusive granites** **PRECAMBRIAN / MID-PROTEROZOIC (*c.*1- 2 billion years old)**	**None**	**ZERO**

3. CONCLUSIONS

- **Solar Development Areas**

Area 1: The area is underlain at depth by unfossiliferous Precambrian basement rocks of the Namaqua-Natal Province (*e.g.* Klipkoppies and Gemsbokbult Granites) as well as Late Caenozoic superficial sediments (Kalahari sands, alluvium, surface gravels) that are, at most, very sparsely fossiliferous (Fig. 1). The palaeontological sensitivity of the area is accordingly VERY LOW, as is the impact significance of the proposed small-scale PV solar development. Pending the discovery of fossil material within the development footprint before or during the development phase (See appended Fossil Chance Finds Procedure), no further specialist palaeontological studies or mitigation are recommended for this project.

Area 2: The area is underlain at depth by unfossiliferous Precambrian basement rocks of the Namaqua-Natal Province (*e.g.* Skierhoek Granite, Friersdale Charnockite) as well as Late Caenozoic superficial sediments (Kalahari sands, alluvium, surface gravels) that are, at most, very sparsely fossiliferous (Fig. 1). The palaeontological sensitivity of the area is accordingly VERY LOW, as is the impact significance of the proposed small-scale PV solar development. Pending the discovery of fossil material within the development footprint before or during the development phase (See appended Fossil Chance Finds Procedure), no further specialist palaeontological studies or mitigation are recommended for this project.

Area 3: The area is underlain at depth by unfossiliferous Precambrian basement rocks of the Namaqua-Natal Province (*e.g.* Friersdale Charnockite) as well as Late Caenozoic superficial sediments (Kalahari sands, alluvium, surface gravels) that are, at most, very sparsely fossiliferous (Fig. 1). The palaeontological sensitivity of the area is accordingly VERY LOW, as is the impact significance of the proposed small-scale PV solar development. Pending the discovery of fossil material within the development footprint before or during the development phase (See appended Fossil Chance Finds Procedure), no further specialist palaeontological studies or mitigation are recommended for this project.

- **Powerline route options**

All three powerline route options traverse broadly similar geological terrain comprising a range a Precambrian igneous and metamorphic rocks of the Namaqua-Natal Province that are extensively mantled by Late Caenozoic superficial sediments such as Kalahari sands, alluvium and surfacegravels. The palaeontological sensitivity of all the powerline route option corridors underconsideration is equally VERY LOW, as is the impact significance of the proposed small-scale powerline development. There is no preference on fossil heritage grounds for any particular route option. Pending the discovery of fossil material within the development footprint before or during the development phase (See appended Fossil Chance Finds Procedure), no further specialist palaeontological studies or mitigation are recommended for this project.

Cumulative impact significance

Several previous desktop palaeontological heritage studies submitted for alternative energy projects in the area northeast of Kenhardt have concluded that the impact significance of developments in this area is negligible to very low as far as fossil heritage is concerned (See reports by Almond under references). The potentially-fossiliferous Late Caenozoic sedimentary units represented here are generally of widespread occurrence in Bushmanland. It is concluded that the anticipated cumulative impact of the proposed new solar PV projects in the context of other alternative energy developments in the region is of LOW significance.

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QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Gauteng, KwaZulu-Natal, Mpumalanga, Northwest and Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has been a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Dr John E. Almond
Palaeontologist
Natura ***V***

<table>
<tr><td colspan="3">CHANCE FOSSIL FINDS PROCEDURE: Kenhardt PV Solar Energy Facility, Farms Gemsbok Bult 120 and 120/9 near Kenhardt, Northern Cape and associated powerline to the existing Nieuwehoop Substation</td></tr>
<tr><td>Province & region:</td><td colspan="2">NORTHERN CAPE, KENHARDT DISTRICT</td></tr>
<tr><td>Responsible Heritage Resources Authority</td><td colspan="2">SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa.
Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Kalahari Group (esp. Gordonia Formation sands, alluvial and pan deposits, calcretes)</td></tr>
<tr><td>Potential fossils</td><td colspan="2">bones and teeth of mammals, fish, reptiles, ostrich egg shells, fish, freshwater and terrestrial molluscs, crabs, trace fossils (e.g. calcretised termitaria, horizontal invertebrate burrows, stone artefacts), petrified wood, leaves, rhizoliths, stromatolites, diatom floras, peats and palynomorphs.</td></tr>
<tr><td rowspan="4">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
• Context – describe position of fossils within stratigraphy (rock layering), depth below surface
• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
• Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
• Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
• Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
• Photograph fossils against a plain, level background, with scale
• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
• Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
</table>

	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX M:

Visual Report

VISUAL IMPACT ASSESSMENT

Scoping and Environmental Impact Assessment for the proposed development of three 100 MW Solar Photovoltaic Facilities (Skeerhok PV 1, PV 2, & PV 3) & 132 kV overhead transmission line near Kenhardt in the Northern Cape Province

Prepared by:
Council for Scientific and Industrial Research
Stellenbosch, South Africa

Contact person:
Luanita Snyman-van der Walt
Tel: +27 21 888 2490
Email: LvdWalt1@csir.co.za

January 2018

Scoping and Environmental Impact Assessment for the proposed development of three 100 MW Solar Photovoltaic Facilities, near Kenhardt in the Northern Cape Province	
Visual Impact Assessment: Environmental Impact Assessment Phase Input	
CSIR Report Number	CSIR/IU/021MH/ER/2017/0013/A
Prepared by	Luanita Snyman-van der Walt (CSIR)
Version	Draft, version 2
Date	January 2018

SPECIALIST EXPERTISE

LUANITA SNYMAN-VAN DER WALT
MSc Environmental Science (NWU)
Pr. Sci. Nat. Environmental Science

Specialisation: Environmental Assessment and Management; Geographic Information Systems; Landscape & Urban Ecology

Luanita commenced work at CSIR in January 2014, after completing a BSc. Botany-Zoology-Tourism, a BSc. Hons. in Environmental Science, as well as a MSc. in Environmental Science at the North West University, Potchefstroom Campus. She is pursuing a MSc. In Geographical Information Science at Vrije Universiteit Amsterdam, and is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg. no. 400128/16).

Her work at the CSIR involves strategic environmental assessment and management, with a focus on Geographic Information System (GIS) analyses for environmental assessment and decision-making.

QUALIFICATIONS

2017 - current	MSc. Geographic Information Science	Vrije Universiteit, Amsterdam, Netherlands
2013	MSc. Environmental Science *(Cum Laude)*	North West University, Potchefstroom, South Africa
2010	BSc. Hons. Environmental Science	North West University, Potchefstroom, South Africa
2009	BSc. Botany- Zoology-Tourism	North West University, Potchefstroom, South Africa

PROJECT TRACK RECORD

Completion	Description	Role	Client
In progress	GEF funded biodiversity and land use projects	Project management, technical/specialist support, and mentoring	SANBI
In progress	Scoping and Environmental Impact Assessment for the proposed development of the Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape	Specialist study: Aquatic Ecology	juwi Renewable Energies
In progress	Sustainable Development Goal Lab on “Mainstreaming resilience into climate change adaptation and disaster risk planning.”	Project leader	Future Earth; Stockholm Resilience Centre; University of Tokyo (funders)
In progress	Strategic Environmental Assessment Aquaculture Development in South Africa	Project member – Technical GIS and mapping	Department of Environmental Affairs
June 2017	Strategic Environmental Assessment for the development of Shale Gas in South Africa	Project officer	Department of Environmental Affairs
December 2017	Guidance for Resilience in the Anthropocene: Investments for development (GRAID) – African Cities.	Project member: Sustainability assessment guideline	Stockholm Resilience Centre (funder)
January 2017	Environmental and Social Impact Assessment for the Floating Liquid Natural Gas project near Kribi, Cameroon.	Project member – Technical GIS and mapping, ecology inputs	Golar
October 2016	Environmental Screening Study for the Giyani Waste Oil Boiler, Limpopo: Environmental management plan for the Hi-Hanyile essential oil distillery	Project manager	CSIR Enterprise Creation for Development

Completion	Description	Role	Client
September 2016	Scoping and Environmental Impact Assessment for 5 x 100 MW Solar PV facilities near Dealesville, Free State.	Project manager	29 Solar
June 2016	Environmental and Social Impact Assessment for the Bomono Early Field Development Project, Cameroon.	Project member - Technical GIS and mapping, ecology inputs	EurOil
May 2016	Scoping and Environmental Impact Assessment for the proposed Development of a 7 x 75 MW Solar Photovoltaic Facilities near Kenhardt, Northern Cape	Project member - Technical GIS and mapping	Mulilo
April 2016	Scoping and Environmental Impact Assessment for the Proposed Development 3 x 75 MW Solar Photovoltaic Facilities near Kenhardt, Northern Cape	Project member - Technical GIS and mapping	Scatec
April 2016	Strategic Environmental Assessment for identification of electricity grid infrastructure development corridors in South Africa	Project member - Technical GIS and mapping	Department of Environmental Affairs
February 2016	Environmental Impact Assessment for the development of 12 Solar PV projects near Dealesville, Free State.	Project member - Technical GIS and mapping, ecology inputs, stakeholder engagement	Mainstream Renewable Energy
September 2015	Environmental Screening Study for the Proposed Vaayu Energy SA Wind Energy Facility near Wesley, Eastern Cape	Project leader	Vaayu Energy
February 2015	Environmental Screening Study for Biochar- and Composting facilities in the Umzimvubu Catchment	Project member - Technical GIS and mapping & ecology inputs	Department of Environmental Affairs
March 2015	Strategic Environmental Assessment for identification of renewable energy zones for wind and solar PV projects in South Africa	Project member - Technical GIS and mapping	Department of Environmental Affairs
November 2014	Rapid environmental screening study for WASA wind monitoring masts (11-15) in the eastern cape, Kwazulu-Natal and Free State provinces, South Africa	Project member - Technical GIS and mapping	CSIR Built Environment
August 2014	Environmental Screening Study for the importation of Liquid Natural Gas into the Western Cape	Project member - Technical GIS and mapping, ecology inputs	Western Cape Government
March 2014	Environmental Screening Study for a Proposed LNG Terminal at Saldanha and associated pipeline infrastructures to Atlantis and Mossel Bay, Western Cape	Project member - Technical GIS and mapping, ecology inputs	PetroSA

SPECIALIST ~~DECLARATION~~

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

VISUAL IMPACT ASSESSMENT: Scoping and Environmental Impact Assessment for the proposed development of three 100 MW Solar Photovoltaic Facilities (Skeerhok PV 1, PV 2, & PV 3) & 132 kV overhead transmission line near Kenhardt in the Northern Cape Province

Specialist:	Council for Scientific and Industrial Research		
Contact person:	Luanita Snyman-van der Walt		
Postal address:	PO Box 320, Stellenbosch		
Postal code:	7599	Cell:	072 182 9718
Telephone:	021 888 2490	Fax:	021 888 4693
E-mail:	Lvdwalt1@csir.co.za		
Professional affiliation(s) (if any)	SACNASP - Pr. Sci. Nat.		

Project Consultant:	Council for Scientific and Industrial Research		
Contact person:	Kelly Stroebel		
Postal address:	PO Box 320, Stellenbosch		
Postal code:	7599	Cell:	082 660 1907
Telephone:	021 888 2432	Fax:	021 888 4693
E-mail:	Kstroebel@csir.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, LUANITA SNYMAN-VAN DER WALT declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

Name of company (if applicable):

12 / 02 / 2018

Date:

EXECUTIVE SUMMARY

This document constitutes the Visual Impact Assessment (VIA) as part of the Environmental Impact Assessment (EIA) for the juwi Skeerhok Solar Photovoltaic (PV) development, consisting of Skeerhok PV1, Skeerhok PV2, Skeerhok PV3, and associated 132 kV powerline (Skeerhok PV – Transmission Line). This assessment draws on VIAs conducted for other solar PV developments in the direct vicinity of the juwi Skeerhok Solar PV development.

The proposed juwi Skeerhok PV development project area is situated approximately 40 km north-east of Kenhardt, Northern Cape. The landscape is characterised as a semi-desert steppe, sparsely vegetated by grassland with patchy occurrence of low shrubs, with a very slight elevation profile, and is mainly used for sheep farming. Existing approvals for solar PV developments, the construction of high-voltage electricity infrastructure in the direct surroundings of the project area, and the Saldanha-Sishen railway with overhead powerlines entails that the rural / pastoral landscape has been transformed by existing infrastructure to have a more industrial/electrical character. Furthermore, the landscape sensitivity, as determined by a Strategic Environmental Assessment which informed the establishment of Renewable Energy Development Zones for South Africa, is classified as low from a visual, scenic, aesthetic and amenity perspective.

The following impact drivers/pathways may lead to visual intrusion impacting on the views of potential sensitive visual receptors:

- Clearance of vegetation for solar field, laydown areas, buildings and roads
- Increased traffic
- Night lighting
- Dust
- Veld fires
- Established infrastructure
- Cumulative effects of the abovementioned impact drivers from all the proposed solar PV development in the proposed project area

A Viewshed Analysis was conducted using ArcMap 10.5 software. The height of the tallest structure on site and the boundary of the farm portions on which the juwi Skeerhok PV development is proposed was used as the extent of the development to simulate ‘worst case’ conditions.

The impact of visual intrusion to the views of potential sensitive visual receptors is expected to be moderate to low (before mitigation) and moderate to very low, with the effective implementation of the mitigation and management actions outlined in this report.

Due to the existing landscape character, and foreseeable trend of renewable energy and associated electricity infrastructure development in the area, the cumulative impacts to the views of

potential sensitive visual receptors are expected to be moderate, if all the proposed solar PV developments in the area implement proposed mitigation measures and best practice to reduce visual impacts.

Based on the findings in this VIA it has been concluded that the juwi Skeerhok PV development, including its associated electricity infrastructure, from a visual, scenic, aesthetic and amenity perspective, may receive EA with adherence to the mitigation and management measures set out in this report.

LIST OF ABBREVIATIONS

DEA	Department of Environmental Affairs
DEM	Digital Elevation Model
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
I&AP	Interested and Affected Party
kV	Kilovolt
NEM:PAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
NHRA	National Heritage Resources Act (Act 25 of 1999)
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
SACAD	South African Conservation Areas Database
SAPAD	South African Protected Areas Database
SEA	Strategic Environmental Assessment
SKA	Square Kilometre Array
VIA	Visual Impact Assessment

GLOSSARY

Definitions	
Landscape baseline	Existing elements, features, characteristics, character, quality and extent of the landscape (GLVIA, 2002).
Landscape character	Distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It creates the particular sense of place of different areas of the landscape (GLVIA, 2002).
Viewer sensitivity	The assessment of the receptivity of viewer groups to the visible landscape elements and visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.
Viewshed	A viewshed is an area of land, water, and other environmental elements that is visible from a fixed vantage point. In digital imaging, a viewshed is a binary raster indicating the visibility of a viewpoint for an area of interest. A pixel with a value of unity indicates that the viewpoint is visible from that pixel, while a value of zero indicates that the viewpoint is not visible from the pixel.
Visual impact assessment	A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts on receptors.
Visual intrusion	The level of compatibility of the project with the particular qualities of the area – its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape (Oberholzer, 2005).
Visual receptors	Viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible.
Visual resource	The visible landscape and its recognisable elements which, through their coexistence, result in a particular landscape and visual character

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS (AS AMENDED)

Requirements of Appendix 6 – GN R326 of NEMA EIA Regulations as amended (7 April 2017)	**Where addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Pg 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Pg 2
c) an indication of the scope of, and the purpose for which, the report was prepared; (ca) an indication of the quality and age of base data used for the specialist report; (cb) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 1.1 – 1.2 Section1.5 Section 2 Section 6.8
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Not applicable, the short vegetation will offer minimal screening and therefore the same impacts are expected throughout the year.
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	Section 2.5 Section 6.1
g) an identification of any areas to be avoided, including buffers;	None
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 2.3 Section 6.1
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6 Section 7 Section 9
k) any mitigation measures for inclusion in the EMPr;	Section 6 Section8
l) any conditions for inclusion in the environmental authorisation;	None
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (ia) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	None
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None at this stage of the EIA process
q) any other information requested by the competent authority.	Peer Review conducted

	(See Appendix A to this report)
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	None

TABLE OF CONTENTS

TABLES AND FIGURES

VISUAL IMPACT ASSESSMENT

1. INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

juwi Renewable Energies is proposing the development of three 100 MW solar photovoltaic (PV) facilities on Smutshoek Farm 395 (Skeerhok PV1 and Skeerhok PV3) and Portion 9 of Gemsbok Bult Farm 120 (Skeerhok PV2), as well as overhead 132 kilovolt (kV) powerlines on farms Smutshoek Farm 395 and Portions 3, 5, and 9 of Gemsbok Bult Farm to connect to the existing Eskom Nieuwehoop substation on Portion 3 of Gemsbok Bult Farm 120, near Kenhardt in the Northern Cape.

Although separate Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes were conducted for the respective Skeerhok PV 1, PV 2, PV 3 projects (full scoping and EIA) and the electricity infrastructure (BA), this VIA report is representative of the entire development, hereafter referred to as the "proposed juwi Skeerhok PV development". This combined approach is due to the cumulative visual consideration of the development. The farm portions on which the juwi Skeerhok PV development is proposed, are collectively referred to as the "project area".

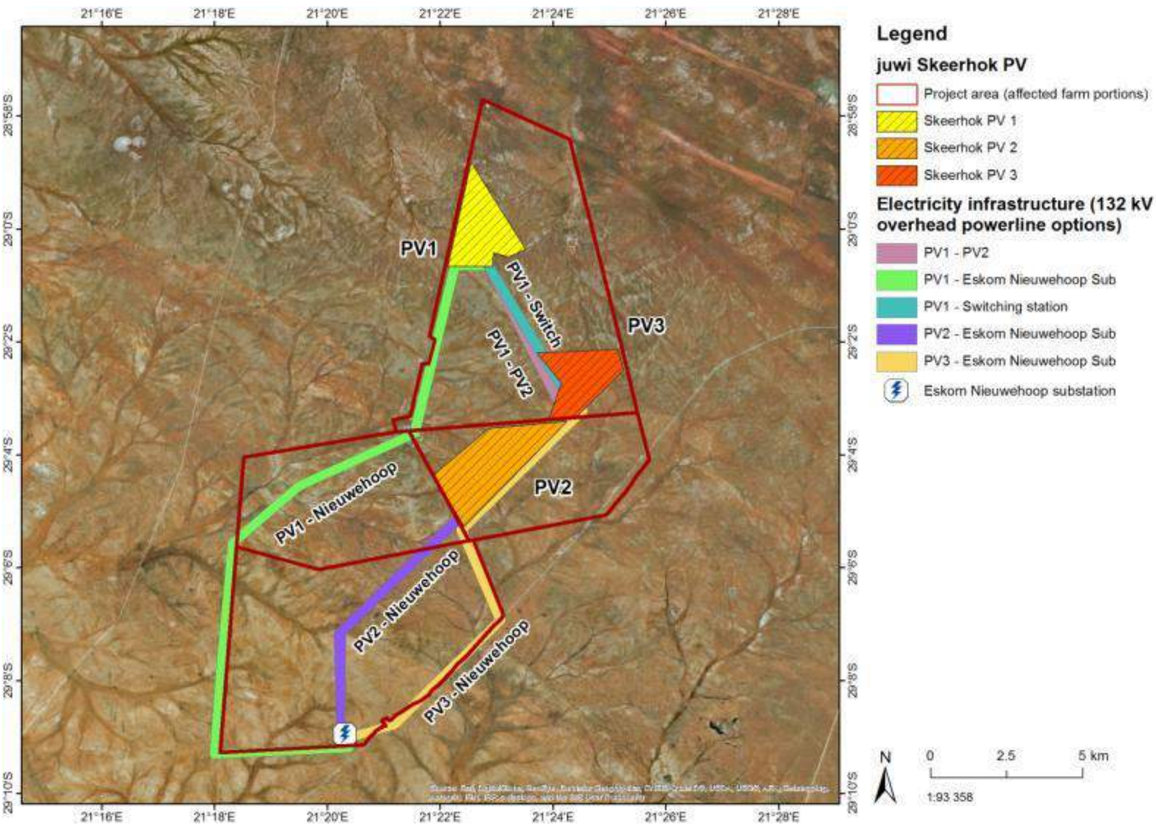


Figure 1: Layout of the proposed juwi Skeerhok solar PV development and 132 kV overhead powerlines.

This document constitutes the Visual Impact Assessment (VIA) as part of the EIA for the juwi Skeerhok PV development, and draws on VIAs conducted for other solar PV developments in the direct vicinity of the solar PV developments proposed by juwi.

1.2 Terms of Reference

The Terms of Reference for this VIA include:

- A desktop review of existing literature (e.g. including the EIAs of neighbouring PV developments);
- Mapping of potential sensitive visual receptors;
- Geographic Information System (GIS) analysis using ArcMap software (Esri Inc., 2017) to determine the visibility of the proposed juwi solar PV development (Viewshed Analysis);
- Impact assessment and cumulative impact assessment;
- Recommendations for mitigation, management and monitoring actions as input to the Environmental Management Programme (EMPr).

1.3 Approach and Methodology

This VIA has been conducted in accordance with the requirements of Appendix 6 of the 2014 NEMA EIA Regulations, and follows guidelines for VIA provided by the Provincial Government of the Western Cape and CSIR (Oberholzer, 2005), and the Landscape Institute of the UK (GLVIA, 2002).

1.3.1 Landscape description

A desktop study was conducted to establish and describe the landscape character of the receiving environment. A combination of data analysis using GIS and a review of existing literature was used to identify and describe landscape elements and character in relation to the visual environment. Potential areas of scenic interest and sensitive visual receptors were also identified.

1.3.2 Viewshed Analysis

A Viewshed Analysis was conducted for the surrounding region of the proposed project area and components of the development relevant to the assessment of the potential visual impact (in a 10 km radius) using ArcMap software (Esri Inc., 2017).

1.3.3 Sensitivity assessment

High-level sensitivity assessment was based on the Strategic Environmental Assessment (SEA) for wind and solar photovoltaic energy in South Africa (DEA, 2015). At a finer scale, potential sensitive visual receptors and/or scenic resources were identified. These generally include: Topographic features; major rivers, water bodies, wetlands; private reserves/resorts; human settlements; national and provincial roads; scenic routes and passes; passenger rail lines; cultural landscapes; national parks; and nature reserves (Oberholzer et al., 2016).

1.3.4 Assessment of impacts and identification of management actions

The consequence of an impact and the likelihood of its occurrence were the main factors in determining the significance of impacts to potentially sensitive visual receptors. The consequence rating also takes into account aspects such as extent and duration of the impact, as well as the sensitivity of the receiving visual environment. Management actions were drawn from best practice and VIAs conducted for other solar PV developments in the region (e.g CSIR, 2015; CSIR, 2016a, CSIR, 2016b).

1.4 Assumptions and Limitations

1.4.1 Consultation

No consultation, apart from that undertaken as part of the formal EIA process, was undertaken. No specific comments or additional issues have been raised by I&APs specifically relating to visual impacts. Furthermore, it is assumed that the potential changes to the current landscape character and impacts to visual receptors have been deemed acceptable to Interested and Affected Parties (I&APs) that participated in the EIA for other approved solar PV projects in the direct vicinity of the proposed Skeerhok PV development.

1.4.2 Desktop assessment

This study is a desktop assessment, drawing on the findings and recommendations of the extensive VIAs as part of EIA reports that have been compiled for the area where the juwi Skeerhok PV development is proposed (e.g. see CSIR, 2015; CSIR, 2016a, CSIR, 2016b).

1.4.3 Mitigation measures

Mitigation measures in this report will assume that construction activities are managed and performed in such a way as to minimise its impact on the receiving environment. The following assumptions, in particular, apply since they are relevant to minimising visual impact during the construction phase:

- Good housekeeping will be maintained on site to avoid litter and minimise waste;
- Construction boundaries will be demarcated and areas of surface disturbance will be minimised;
- Existing roads will be used where possible;
- Vegetation removal and surface disturbance will be minimised and take advantage of existing clearings;
- Topsoil from the site will be stripped, stockpiled, and stabilised before excavating earth for the construction of the facility;
- Plant material from indigenous vegetation removal will be mulched and applied to disturbed/exposed soil to aid in the rehabilitation process;

- Plans will be set in place to control and minimise erosion risks, and rehabilitate cleared areas as soon as possible; and
- Plans will be in place to minimise fire hazards and dust generation.

1.4.4 Cumulative impacts

Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 20 km radius. The existing and proposed developments that were taken into consideration for cumulative visual impacts include solar PV developments in direct vicinity of the juwi Skeerhok PV development project area:

- Three 75 MW solar PV facilities proposed by Mulilo Renewable Project Developments in 2014 – all of which have received Environmental Authorisation (EA) (CSIR, 2015);
- Seven 75 MW solar PV facilities proposed by Mulilo Renewable Project Developments in 2015 – four of which have received EA (CSIR, 2016a); and
- Three 75 MW solar PV facilities proposed by Scatec Solar SA in 2015– all of which have received EA (CSIR, 2016b).

The Department of Environmental Affairs (DEA) has indicated that, due to the potential impact of renewable energy development to the Square Kilometre Array (SKA), it envisages that no more than six approved renewable energy developments will be awarded preferred bidder status in the Kenhardt area. This being said, the cumulative visual impact assessment was based on the precautionary approach and assumed that all projects will be developed (i.e. 'worst case scenario') within the area for the cumulative impact assessment, and provides a statement on how the cumulative impacts would differ if only six projects were to be constructed.

1.4.5 Accuracy of spatial data

The most recent available and obtainable spatial data was utilised for this VIA. It must be noted that the spatial data originate from different sources and have been created at various scales and resolutions. Discrepancies and scale incompatibilities may exist. Furthermore, data from the SPOT Building Count (see Table 1) has been used to identify potential sensitivity visual receptors. However, it must be noted that not all structures recorded in the SPOT Building Count are necessarily occupied, and have not been verified as part of this VIA.

1.4.6 Viewshed Analysis

Viewsheds were calculated using a 20 m resolution Digital Elevation Model (DEM). The viewshed calculations do not take into account the potential screening effect of other vertical structures in the landscape, such as vegetation and buildings. Due to the relatively low vegetation cover in the region and the size and extent of the solar energy facility, the screening potential of vegetation is likely to be minimal over most distances.

The maximum height of the highest component of the entire development (i.e. Skeerhok PV areas and associated electricity infrastructure (see Table 3)) was used for the viewshed analysis to simulate a worst-case scenario. The boundary of the farm portions on which the juwi Skeerhok PV development is proposed (project area) was used as the extent of the development, again to simulate 'worst case' conditions.

1.5 Information sources

1.5.1 Literature

The following literary information was used for conducting this VIA:

- Documentation supplied by the developer and the CSIR Environmental Assessment Practitioner;
- SEA for wind and solar photovoltaic energy in South Africa (DEA, 2015); and
- EIA reports for surrounding PV developments (CSIR, 2015, 2016a, 2016b).

1.5.2 Spatial data

The spatial data sets used for the landscape description and viewshed analysis are presented in Table 1 below.

1.5.3 Software

The following software was used for the landscape description and viewshed analysis included in this VIA:

- Esri ArcMap software (Esri Inc., 2017); and
- Google Earth (Google Inc., 2015).

Table 1: Spatial data utilised for the juwi Skeerhok PV development Visual Impact Assessment.

Data	Date	Description	Resolution/ scale	Format	Source
South African National Land Cover	2014	The land-cover dataset covers the whole of South Africa and is presented in a map-corrected, raster format. The dataset contains landcover classes, ranging from natural to man-made landscape characteristics.	30 m	Raster	South African Department of Environmental Affairs
Digital Elevation Model	2002	20m digital contours, spotheights, coastline and inland water area data captured from South African 1:50 000 scale topographical mapping.	20 m	Raster	
Roads	2006	Geometric location and attribute information of road centrelines.	1:50 000	Vector (polyline)	South African Department of Rural Development and Land Reform
Railways	2006	Geometric location and attribute information of rail centrelines.	1:50 000	Vector (polyline)	South African Department of Rural Development and Land Reform
SPOT Building Count	2011	The location of dwelling units/building structures or dense informal areas mapped using SPOT 2.5 m natural colour satellite imagery.	2.5 m	Vector (points)	Eskom
Towns	2004	Extent of town allotments.	1: 25 000	Vector (polygon)	South African Chief Surveyor General

Data	Date	Description	Resolution/ scale	Format	Source
South African Protected Areas and South African Conservation Areas	2017	The South African Protected Areas Database (SAPAD) and Conservation Areas Database (SACAD) contains spatial data for the conservation estate of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. Quarter 3 of 2017.	1: 5 000	Vector (polygon)	South African Department of Environmental Affairs
South African Renewable Energy EIA Application Database	2017	The South African Renewable Energy EIA Application Database contains spatial data for renewable energy applications for environmental authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications. Quarter 3 of 2017.	1: 5 000	Vector (polygon)	South African Department of Environmental Affairs

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The proposed juwi Skeerhok PV development project area is situated approximately 40 km north-east of Kenhardt, Northern Cape – a sparsely populated town with approximately 4 843 people living at a density of 30.39 per km^2 (StatsSA, 2011).

2.1 Land cover

The landscape is characterised as a semidesert steppe that is sparsely vegetated by grassland with patchy occurrence of low shrubs (Mucina et al., 2006) (Figure 2). The low vegetation and flat terrain provides very limited screening from infrastructure features situated in the landscape/

Figure 2: Photograph depicting the patchy grassland and low shrubland vegetation (CSIR, 2016a; photo credit: Henry Holland).

2.2 Elevation and slope

The elevation characteristics of the project area are very slight (ranging from ~ 900 m – 1050 m) (Figure 3) with an average of slope of 0.5 %, an elevation gain of approximately 27 m on the north-east profile (across 14 km) and 31 m on the east-west profile (across 6 km) (Figure 4) (Google Inc., 2015).

The rolling terrain provides wide open views. Incisions in the terrain would offer limited screening from infrastructure.

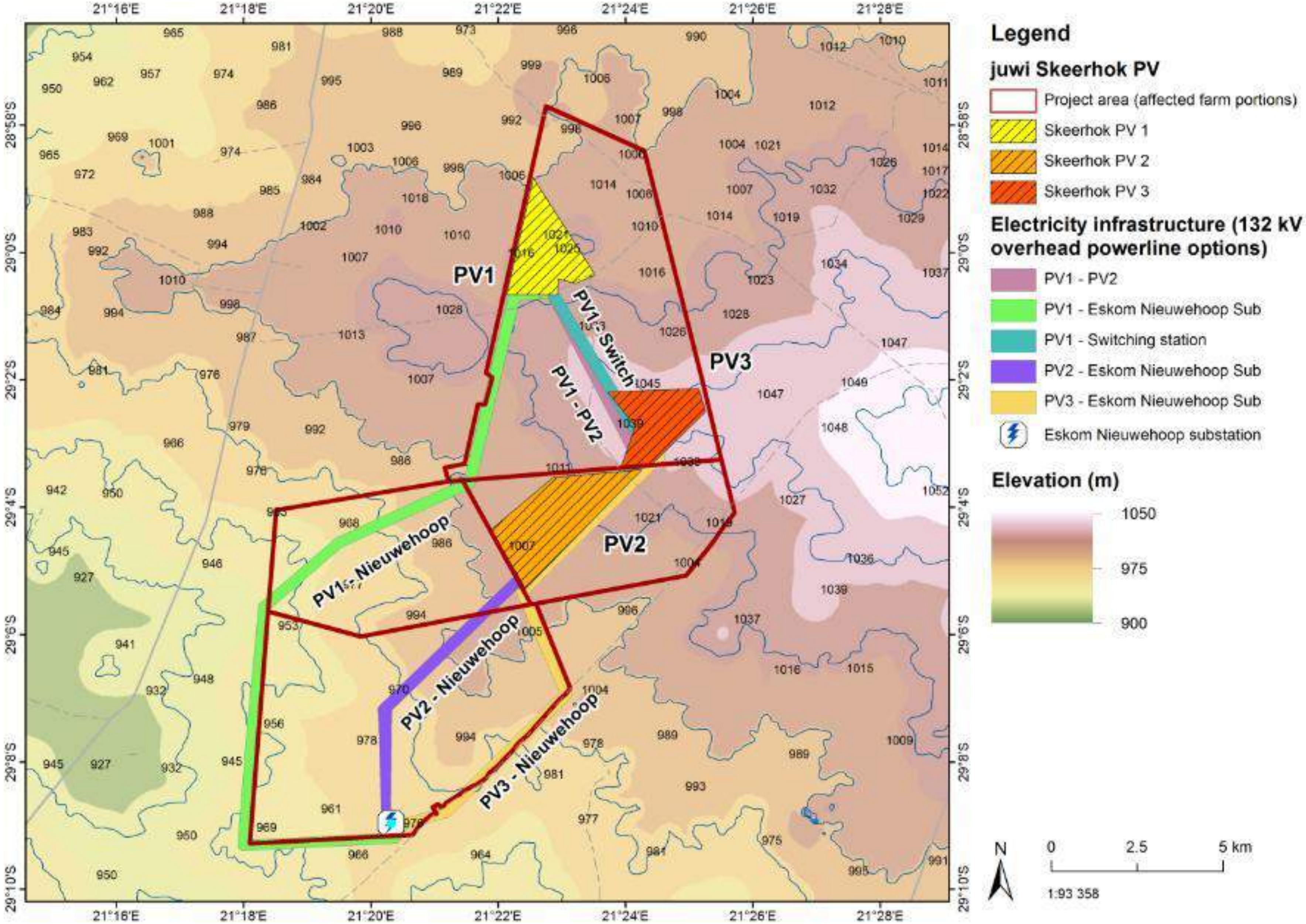
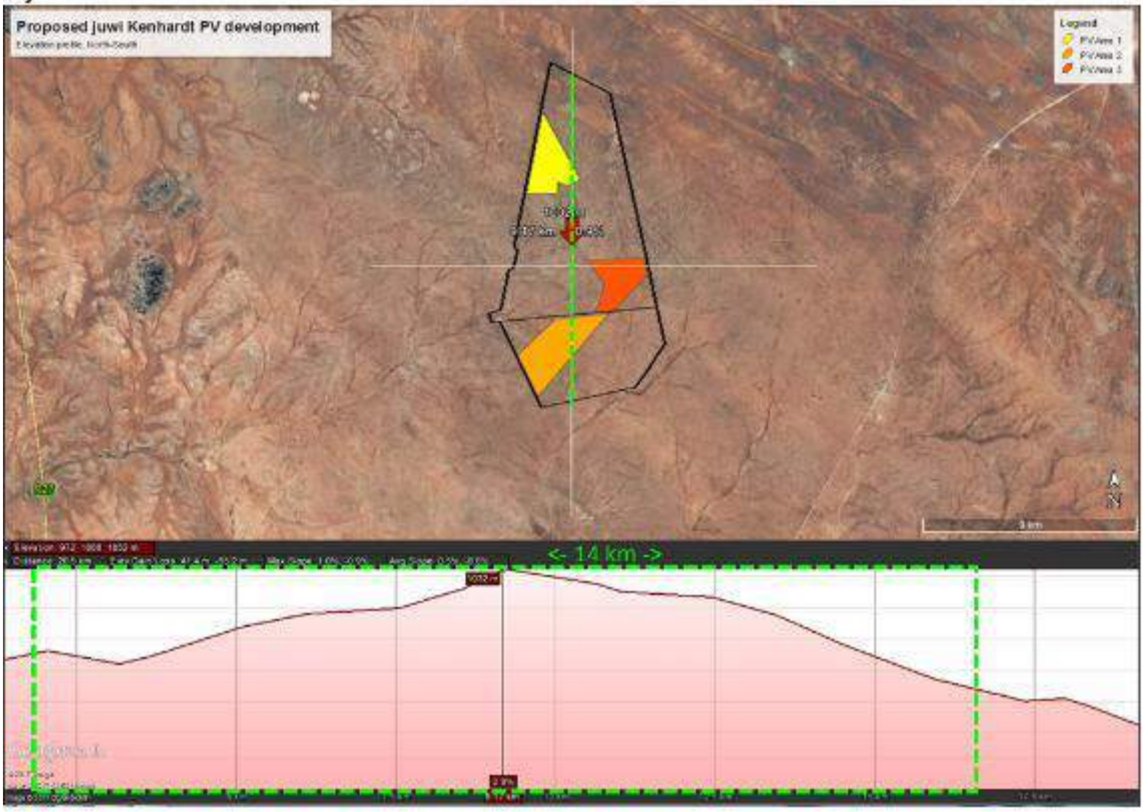


Figure 3: juwi Skeerhok PV1, PV2 and PV3, and associated electricity infrastructure connecting to the existing Eskom Nieuwehoop substation.

a)



b)

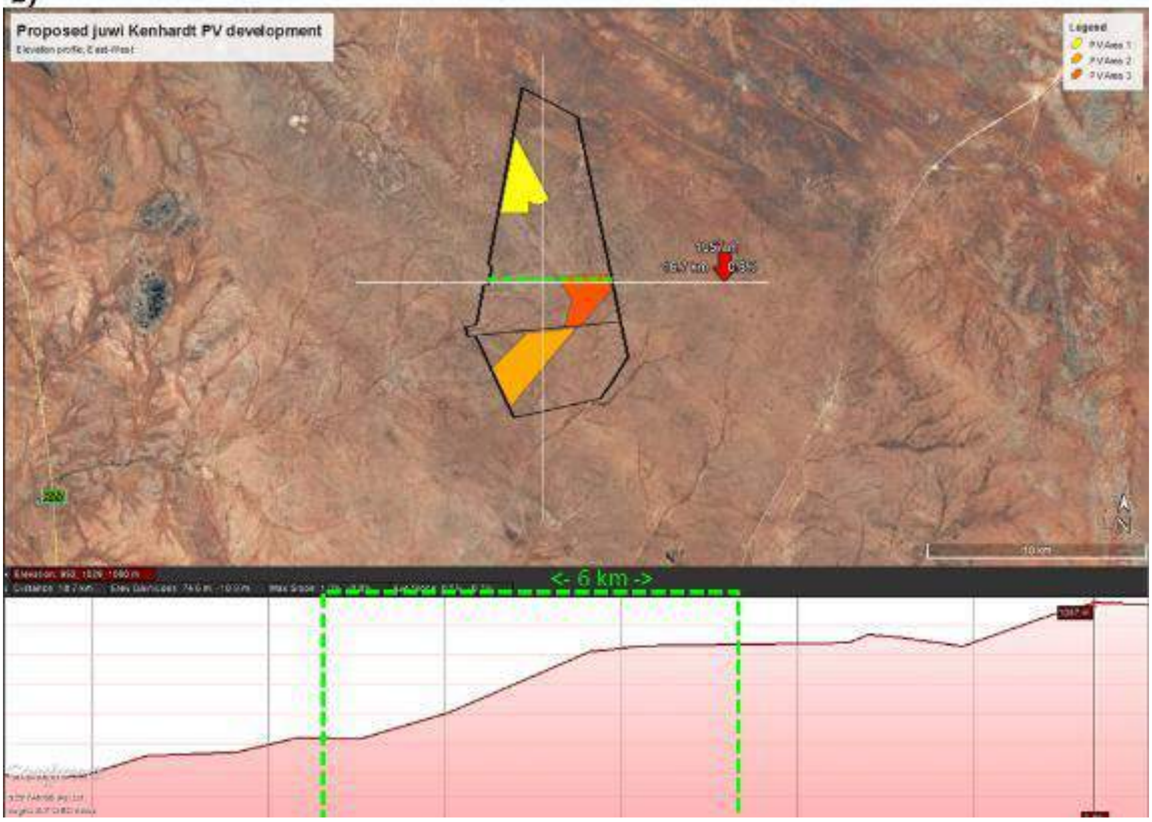


Figure 4: Image indicating the location and position of the juwi Skeerhok PV development project area in the landscape. The green dotted lines indicate the position of the project area in the landscape. There is an elevation gain of approximately a) 27 m on the north-east profile (a) and approximately 31 m on the east-west profile (b) (Google Inc., 2015).

2.3 Infrastructure and land-use

2.3.1 Road

The project area is situated approximately 20 km east of the R27 major provincial road and 20 km north of the R383 secondary road. The R27 connects Upington to Cape Town and may are often utilised by tourists visiting towns along the Orange River valley.

2.3.2 Rail

The south-eastern side of the project area is bordered by the Sishen-Saldanha iron ore railway line that is electrified with overhead lines (Figure 5). A gravel access road runs parallel to the railway line.

Figure 5: Photograph depicting Saldanha-Sishen iron ore railway bordering the south-eastern side of the project area (CSIR, 2016a; photo credit: Henry Holland).

2.3.3 Electricity

The project area does not currently have any high-voltage electricity infrastructure constructed on it. The closest distribution lines are situated approximately 7 km west of the project area, with the high-voltage transmission line that supplies Kenhardt with electricity more than 60 km to the south. A new high-voltage substation, Eskom Nieuwehoop, is currently being constructed just 7 km south of the project area (Figure 6; Figure 8) and will most probably have high-voltage transmission lines connecting to it in the future.

Figure 6: Photograph depicting the Eskom Nieuwehoop substation under construction (CSIR, 2016a; photo credit: Henry Holland).

2.3.4 Buildings/Structures

According to the SPOT Building Count (Eskom, 2011) there are several buildings/structures within 10 km of the project area. At this stage, these are assumed to be mostly farmsteads which are typical of a rural or pastoral environment. It is possible that existing views from these buildings/structures may be affected by the proposed juwi Skeerhok PV development.

2.4 Cultural landscape

Primary features characterising the cultural landscape include fences, water troughs and wind pumps. The sense of place may be described as a remoteness, which has been disturbed by the presence of the Saldanha-Sishen railway, Eskom Nieuwehoop Susbtation and electricity transmission lines (ASHA Consulting, 2018). No visually interesting features exist in the landscape. It is unlikely that the proposed development is visible to anyone other than local residents travelling on the gravel road next to the railway line, or inhabitants of the farms on which the juwi Skeerhok PV development is proposed.

2.5 Visual character

The landscape characteristics described in Sections 2.1 - 2.4 collectively constitute the visual character of the area (Figure 7). The short and sparse vegetation, flat terrain with wide open views characterise this remote rural / pastoral landscape. However, the Eskom Nieuwehoop Substation, along with sufficient solar resource, may be seen as a driver for renewable energy projects, specifically solar PV projects, in the Kenhardt area. A cluster of ten approved 75 MW PV developments are proposed directly towards the south-west of the proposed juwi Skeerhok

PV development. Although construction on these proposed developments has not yet commenced, it is reasonable to assume that they will be constructed in the future (5 – 10 years). Since these projects have all received EA, it is also assumed that the potential changes to the current landscape character and impacts to visual receptors have been deemed acceptable to Interested and Affected Parties (I&APs) that participated in the EIA for the approved solar PV projects.

The approval of solar PV developments and construction of high-voltage electricity infrastructure in the direct surroundings of the project area would contribute to the evident transformation of a rural / pastoral landscape towards a more industrial/electrical landscape character.

Rural / pastoral	**Scattered buildings/structures**	**Patchy grassland and low shrubland**
Saldanha-Sishen industrial railway	**Eskom Nieuwehoop Substation**	**Solar PV developments**

Figure 7: Summary of the key landscape elements that characterise the proposed juwi Skeerhok PV development project area and surrounds.

2.6 Visual receptors

The potential visual receptors that may be impacted by the proposed juwi Skeerhok PV development that have been identified in this desktop Scoping investigation mainly include:

- National protected/conservation areas;
- Residents of farms in and around the project area;
- Residents of towns within the vicinity of the project area; and
- Road users of the R27, R383 and other access roads in and around the project area.

Based on the distances of the project area from protected areas, tourist and major access routes, and the town of Kenhardt (Table 2; Figure 8) it is unlikely that the views of these potential visual receptors will be significantly adversely affected by the proposed juwi Skeerhok PV development. The greatest risk of visual impact would be to residents of farms in and around the project area.

Table 2: Potential visual receptors that may be impacted by the proposed juwi Skeerhok PV development.

Potential sensitive visual receptor	Distance and direction from project area
Residents of farms in and around the project area	17 structures are seemingly present on the proposed project area, with multiple present within 20 km of the project area. Not all of these structures are necessarily occupied. And discrepancies in the SPOT building count data may also register farm dams or kraals as buildings.
Motorists on other major access - R383	19 km south
Motorists on tourist routes - R27	20 km west
Residents of towns – Kenhardt	26 km south west
Visitors to and residents/staff of protected/conservation areas	48 km north west (Tierberg Nature Reserve)

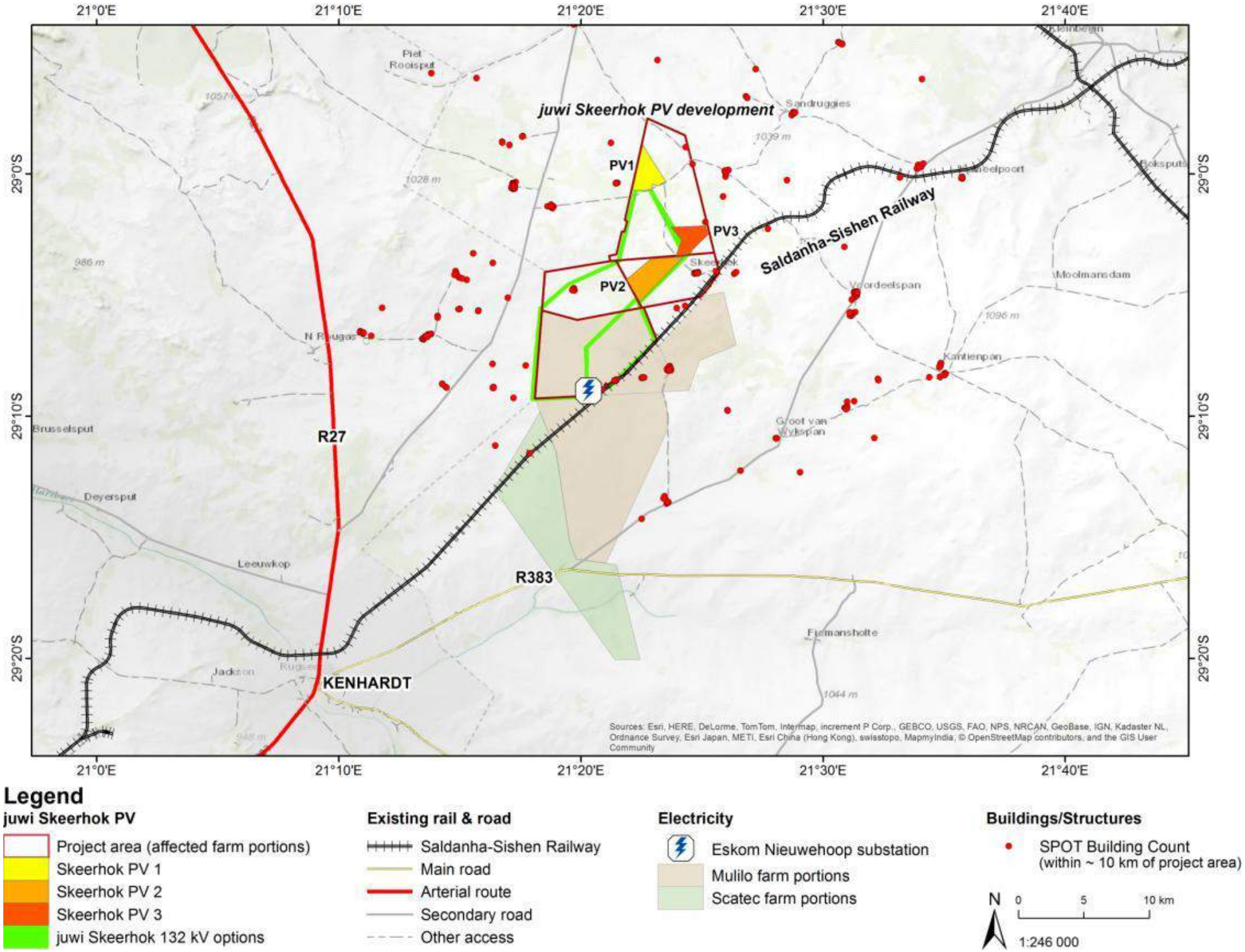


Figure 8: Summary of key landscape features and potential sensitive visual receptors in the project area and surrounds.

2.7 Sensitivity

The juwi Skeerhok PV development is situated within a Renewable Energy Development Zone (REDZ) – specifically the Upington REDZ - which was investigated as part of the SEA for wind and solar photovoltaic energy in South Africa commissioned by the DEA (DEA, 2015). The SEA included an assessment of the landscape sensitivities of features within REDZ which considered visual, scenic, aesthetic and amenity value. "Landscape sensitivity was determined as part of this study through the identification of natural, scenic and cultural resources which have aesthetic and economic value to the local community, the region, and society as a whole." (DEA, 2015: part 3, section 2, pg 2).

The landscape/visual sensitivity of the area where the juwi Skeerhok PV development is proposed, has been classified as having a low sensitivity to solar PV development (Figure 9).

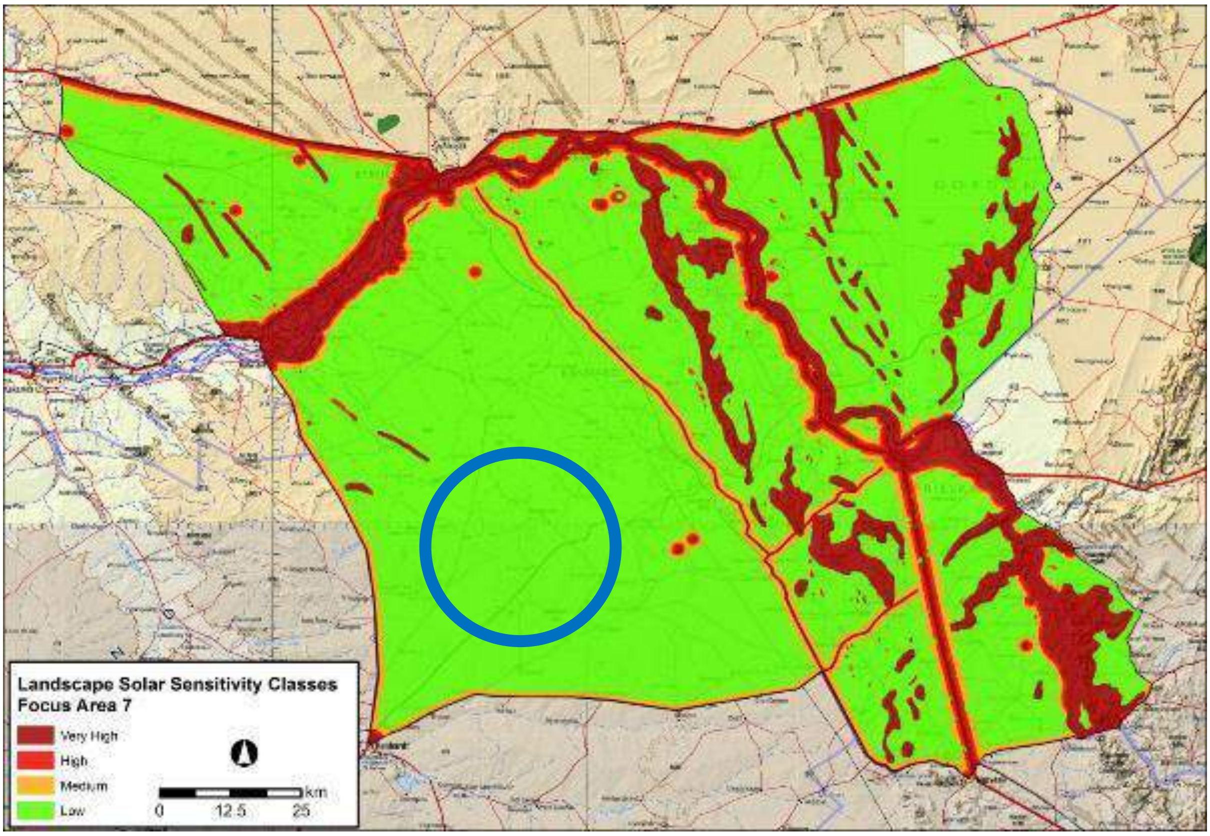


Figure 9: Landscape sensitivity of the Upington REDZ. The blue circle indicates the approximate location of the juwi Skeerhok PV development within an area classified as having low sensitivity to solar PV development (DEA, 2015).

3. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO VISUAL IMPACTS

Project aspects that may result in impacts to sensitive visual receptors mainly include established vertical infrastructure components and other features in stark contrast with the rest of the landscape (Table 3) that will be visible in the flat landscape with low growing vegetation.

Table 3: Height specifications of the juwi Skeerhok PV development infrastructure. The maximum height (i.e. 32 m) was used for the viewshed analysis.

Component	Maximum Height
SOLAR PV AREA	
Solar Panels	5 m
Operations and Management buildings	8 m
Security Fencing	3 m
Battery storage systems	8 m
ELECTRICITY INFRASTRUCTURE	
On-site collector substation	30 m
132 kV overhead power line	30 m
Telecommunication tower	32 m

The maximum height (i.e. 32 m) was used for the viewshed analysis as a worse-case scenario. However at a height of 5 m, it's not expected that the solar fields will cause significant visual impact to an observer on the ground.

4. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

No specific legislation or permits pertaining to visual resources and/or the protection of scenic resources currently exists in South Africa. However, the legislation presented in Table 4 may be of relevance to scenic resources (Oberholzer et al., 2016).

Table 4: National legislation relating to the protection of scenic resources (Oberholzer et al., 2016).

Instrument		Objective
National	National Environmental Management: Protected Areas Act, (Act 57 of 2003) (NEMA:PAA)	The Minister / MEC may restrict or regulate development in a 'protected environment' that may be inappropriate for the area given the purpose for which the area was declared (Section 5).
	National Heritage Resources Act (Act 25 of 1999) (NHRA)	Includes protection of national and provincial heritage sites, as well as areas of environmental or cultural value, and proclaimed scenic routes.

Provincial	NEM:PAA Section 17	Local authority zoning schemes can be used to protect natural and cultural heritage resources through ‘Conservation Areas’, ‘Heritage Overlay Zones’ and ‘Scenic Overlay Zones’ including scenic routes.

5. IDENTIFICATION OF KEY ISSUES

5.1 Key Issues Identified During the Scoping Phase

The following impact drivers/pathways may lead to visual intrusion to the views of sensitive visual receptors:

- Clearance of vegetation for solar field, laydown areas, buildings and roads
- Increased traffic
- Night lighting
- Dust
- Veld fires
- Established infrastructure
- Cumulative effects of the abovementioned impact drivers of all proposed solar PV development in the proposed project area

The Draft Scoping Report containing the VIA input was released for a 30-day comment period from 20 September - 23 October 2017. To date, no specific comments or additional issues have been raised by I&APs specifically relating to visual impacts.

5.2 Identification of Potential Impacts

The vertical infrastructure components associated with the powerline, and potentially stark contrast of the solar field with the rest of the landscape will facilitate changes to the landscape character and impact on the views of potential sensitive visual receptors. However, the existing approvals for solar PV developments and the construction of high-voltage electricity infrastructure in the direct surroundings of the project area will establish a new status quo industrial/electrical landscape character, should they be constructed. The potential risks to sensitive visual receptors have been extensively investigated during the EIA processes for the Mulilo (CSIR, 2016a; 2015) and Scatec (CSIR, 2016b) solar PV developments (. The VIAs for these proposed developments have established the following:

- The landscape has a rural agricultural character which has been transformed by extensive stock farming and large scale infrastructure in the form of the Sishen-Saldanha ore railway line and the Eskom Nieuwehoop Substation;
- Identified sensitive visual receptors include:

    - Residents and viewpoints on farms surrounding the proposed development site. These are highly sensitive visual receptors since they have an active interest in their surrounding landscape; and
    - Motorists using the R383 and the Transnet Service Road (Loop 14) adjacent to the ore railway line. Motorists are classified as low sensitivity visual receptors since they pass through the landscape and their attention is mostly focused on the road.
- Visual intrusion on the existing views of highly sensitive visual receptors will be moderate since the development will be noticed but the quality of views is already compromised by large existing structures. The significance of the impact is moderate before mitigation and low if mitigation is successful. Mitigation measures should lower the consequence of the impact from substantial to moderate and the significance of the impact to low.
- The impact of night lighting of the facility on the nightscape (during the operational phase) is likely to be negligible compared to that of the nearby substation if a lighting plan is prepared which minimises light spill onto adjacent properties and avoids glaring lights which may affect visual receptors in the surrounding landscape.
- Cumulative visual impact on sensitive visual receptors is low due to the existing and new structures which have severely limited potential scenic views in the region. Furthermore, the landscape is rapidly changing due to the introduction of large scale and highly visible rail and electrical infrastructure.
-

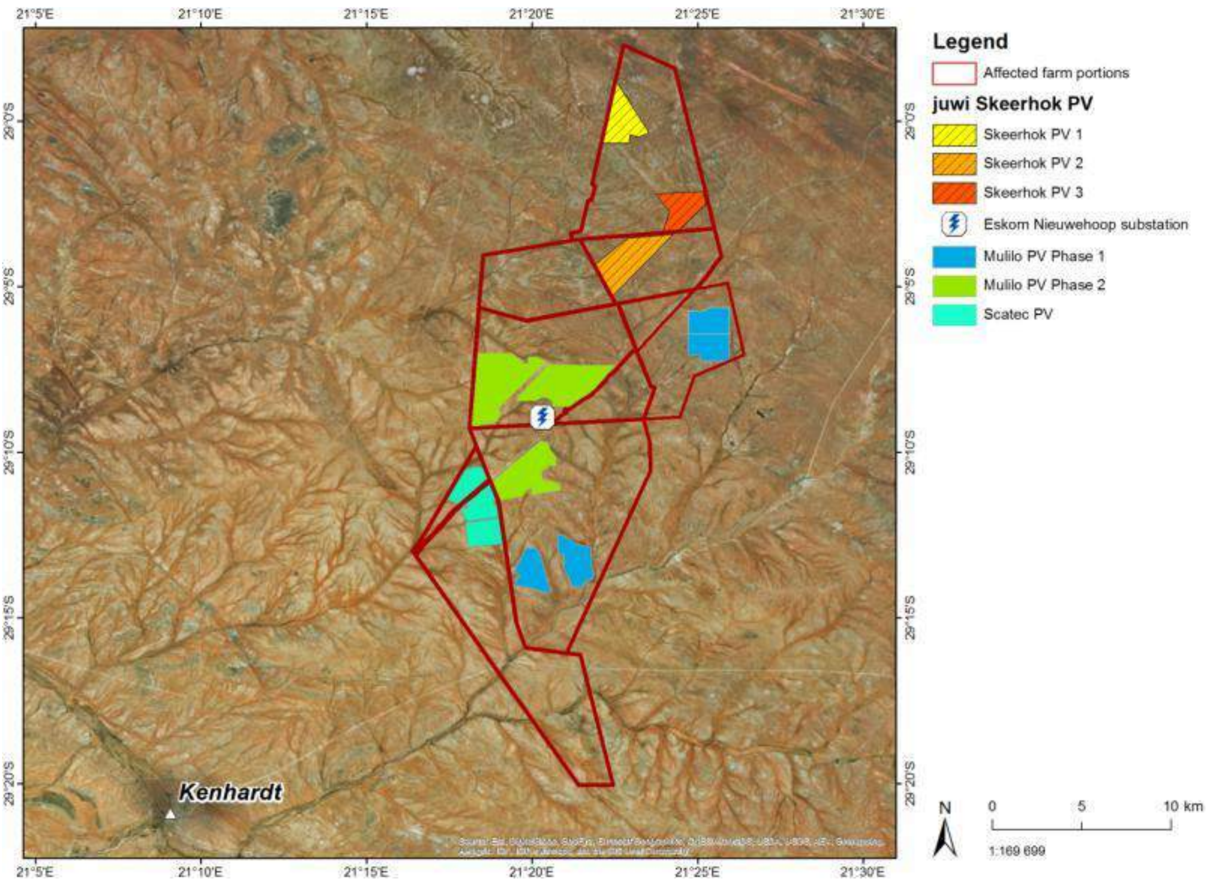


Figure 10: Solar PV developments in direct vicinity of the juwi Skeerhok PV development project area include the proposed Mulilo PV Phase 1, Mulilo PV Phase 2, and Scatec PV. These were considered for the cumulative impact assessment.

Key impact drivers that may intrude the views of sensitive visual receptors are presented in

Table 5.

Table 5: Key project aspects may result in impacts to the views of sensitive visual receptors and the associated project phase.

Impact	Impact pathway/driver	Project phase		
		Construction	Operation	Decommissioning
Visual intrusion to the views of sensitive visual receptors	Clearance of vegetation for solar field, laydown areas, buildings and roads	X		X
	Construction/decommissioning activities (all infrastructure, incl. roads, substations and transmission lines)	X		X

Increased traffic	X	X	X
Night lighting	X	X	X
Dust	X	X	X
Veld fires	X		X
Established infrastructure (vertical electricity infrastructure; contrasting solar field)		X	
Cumulative effects of the abovementioned impact drivers of all proposed solar PV development in the proposed project area	X	X	X

6. ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Viewshed Analysis

A Viewshed Analysis was conducted using ArcMap 10.5 software (Esri, 2017). The height of the tallest structure on site was used to simulate 'worst case' conditions. The tallest structure proposed as part of the juwi Skeerhok PV development is the telecommunication tower at 32 m (refer to Table 3). It was assumed that potential visual receptors will have an average height of 1.7 m. The boundary of the farm portions on which the juwi Skeerhok PV development is proposed (project area) was used as the extent of the development, again to simulate 'worst case' conditions, as well as to ensure that the results of the assessment are independent of the final placement of any infrastructure on site.

The Earth's surface curves out of sight at a distance of 5 km (Wolchover, 2012). The visual assessment zone used for the Viewshed Analysis is 10 km. The gradual nature of the landscape (i.e. no steep slopes) as well as the uncomplicated, low-growing vegetation (refer to Section 2), entailed that no additional environmental structures, that may screen the development from the view of potential receptors (e.g. tall trees), were considered in the analysis.

6.1.1 Results of the Viewshed Analysis

The result of the Viewshed Analysis produces a spatial output which indicates from where in the landscape the proposed juwi Skeerhok PV development would theoretically be visible (Figure 11). Due to the distances from potentially sensitivity visual receptors, specifically motorists on the

R27 and residents of the town of Kenhardt, it is unlikely that the juwi Skeerhok PV development will negatively impact these visual receptors. The juwi Skeerhok PV development will be visible from some buildings/structures, especially those situated on site and within 2.5 km of the project area.

6.1.2 Results of the cumulative Viewshed Analysis

To determine potential cumulative impacts, the Viewshed analysis was also conducted for the proposed Mulilo, Scatec and juwi Skeerhok PV developments. The visual ‘footprint’ of the juwi Skeerhok PV development overlaps mostly with those of the Mulilo and Scatec developments, and the addition of the juwi Skeerhok PV development extends towards the north, even farther away from Kenhardt and the R27 road (Figure 12).

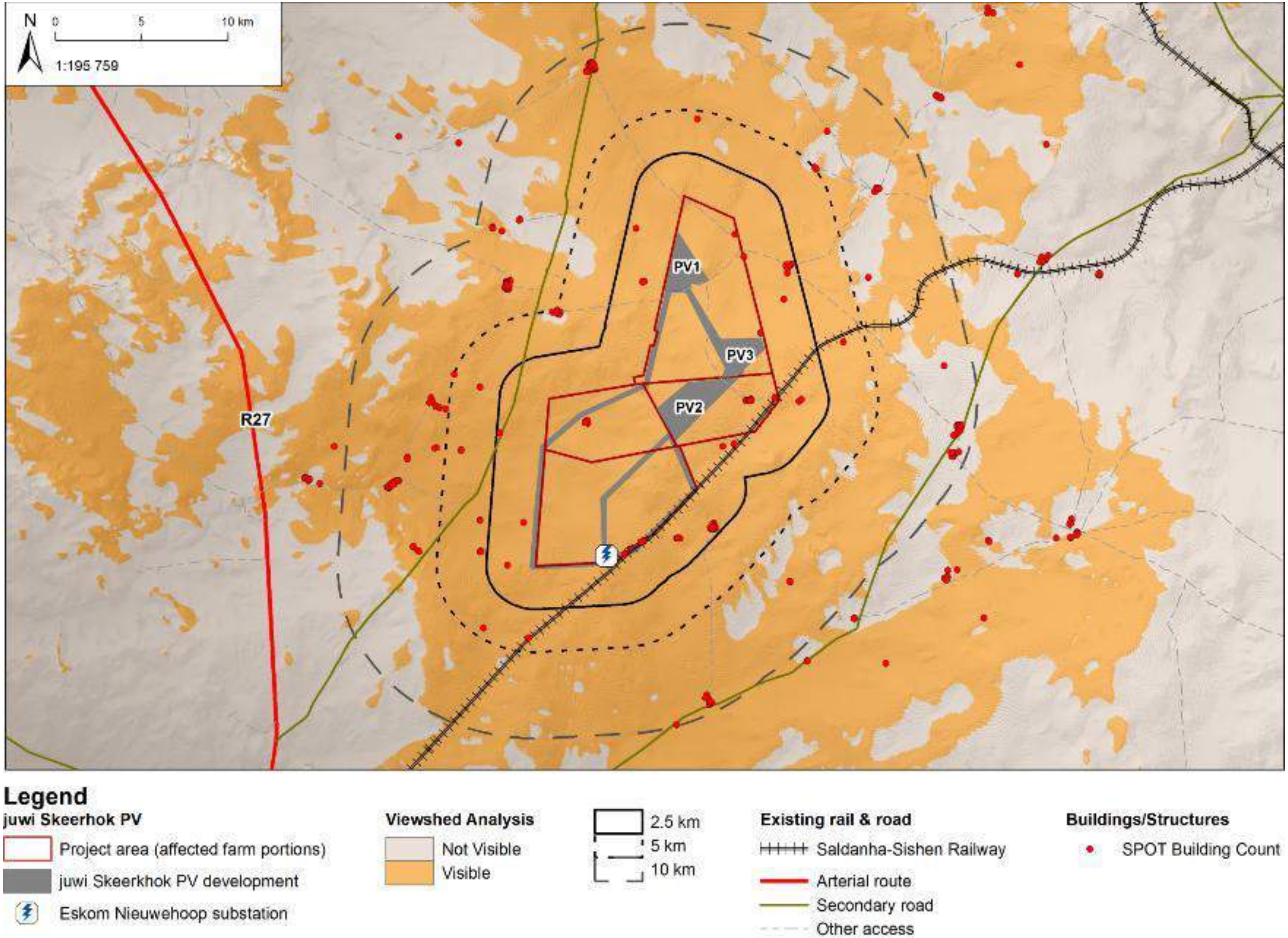


Figure 11: Viewshed Analysis for the juwi Skeerhok PV development.

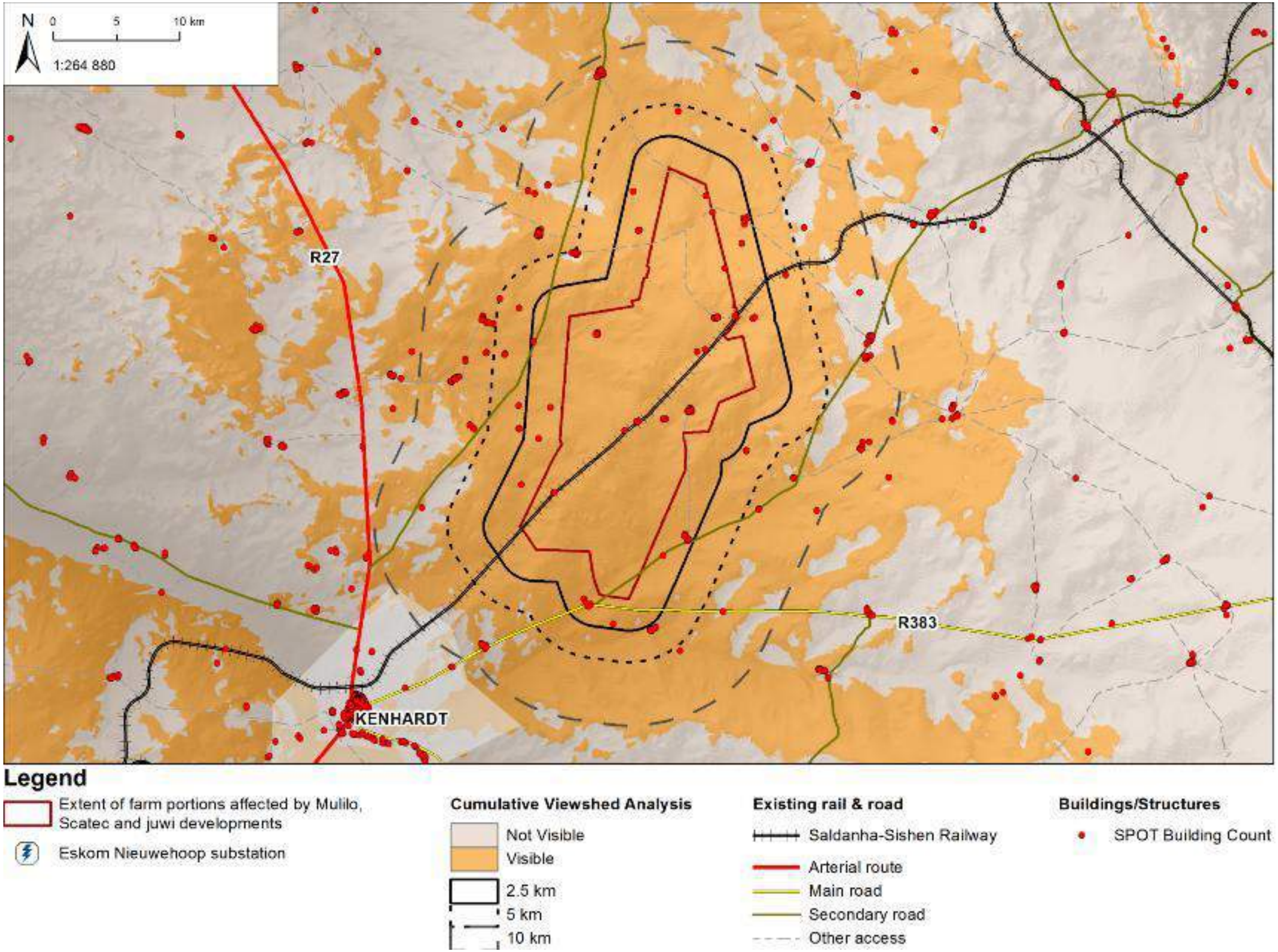


Figure 12: Cumulative Viewshed Analysis for the proposed Mulilo (CSIR, 2015 & 2016a) and Scatec (CSIR, 2016b) PV developments, together with the proposed juwi Skeerhok PV development.

6.2 Potential Impact: Clearance of vegetation

CLEARANCE OF VEGETATION

Project phases

- Construction.
- Decommissioning.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *vegetation clearance* may have a local impact. The probability of vegetation clearance is very likely, and the consequence substantial. However, the disturbance is expected to be of short-to-medium term duration – during the construction and decommissioning phases only.

Proposed mitigation measures

- Minimise the footprint of cleared vegetation.
- Where possible, laydown areas and temporary construction equipment and camps should be placed in already disturbed areas in order to minimise vegetation clearing.
- Phased clearance of the area for solar field in order to reduce the amount and duration of bare soil exposure.
- Commence with restoration of disturbed, cleared land as soon as possible.
- Maintain rehabilitated surfaces until vegetation is established, sustainable and blends well with surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Control Officer (ECO).

Significance of impact

Before mitigation	**With mitigation**
Moderate	Low

6.3 Potential Impact: Increased traffic

INCREASED TRAFFIC

Project phases

- Construction.
- Operation.
- Decommissioning.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *increased traffic* may have a regional impact. The probability of increased traffic is likely, and the consequence moderate. The disturbance is expected to be of long-term duration – and may be expected to be most pronounced during the construction and decommissioning phases.

Proposed mitigation measures

- Plan trips so that it occurs during the day and where possible avoid construction vehicles movement on the regional road during peak time
- Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only.

Significance of impact

Before mitigation	**With mitigation**
Moderate	Low

6.4 Potential Impact: Night lighting

NIGHT LIGHTING

Project phases

- Construction.
- Operation.
- Decommissioning.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *night lighting* may have a regional impact. The probability of night lighting is likely, and the consequence moderate. The disturbance is expected to be of long-term duration – and may be expected to be most pronounced during the construction and decommissioning phases.

Proposed mitigation measures

- Develop a lighting plan that:
  - documents the design, layout and technology used for lighting;
  - indicates how nightscape impacts will be minimised;
  - includes a process for quick and effective resolution of lighting complaints; and
  - Do not exceed the minimum lighting requirement for effective safety and security.
- Minimise bright light (uplighting and glare) with appropriate screening.
- Reduce light pollution through the use of low-pressure sodium light sources.
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.
- Avoid light spilling beyond the project boundary.
- Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting.
- Switch off lights when not in use.

Significance of impact

Before mitigation	**With mitigation**
Low	Very low

6.5 Potential Impact: Dust generation

DUST GENERATION

Project phases

- Construction.
- Operation
- Decommissioning.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *dust generation* may have a local impact. The probability of dust generation is very likely, and the consequence slight. The disturbance is expected to be of long-term duration – mainly during the construction and decommissioning phases, with potential dust generation by maintenance vehicles during operation..

Proposed mitigation measures

- Implement standard construction site dust control methods (i.e. dampening with water) as required.

Significance of impact

Before mitigation	**With mitigation**
Low	Very low

6.6 *Potential Impact: Veld fires*

VELD FIRES

Project phases

- Construction.
- Decommissioning.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *veld fires,* which can cause smoke and burnt vegetation, may have a local impact. The probability of veld fires is unlikely, and the consequence slight. The disturbance is expected to be of short-to-medium term duration – during the construction and decommissioning phases.

Proposed mitigation measures

- Implement fire risk reduction and containment measures, including:
  - worker awareness;
  - designated, safe smoking areas;
  - fire breaks; and
  - appropriate and working firefighting equipment.

Significance of impact

Before mitigation	With mitigation
Low	Very low

6.7 *Potential Impact: Established Infrastructure*

ESTABLISHED INFRASTRUCTURE:
VERTICAL ELECTRICAL INFRASTRUCTURE

Project phases

- Operation.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *established infrastructure* may have a regional impact. The probability of established vertical infrastructure is very likely, and the consequence moderate. The disturbance is expected to be of long-term duration – during the operation phase.

Proposed mitigation measures

- Use appropriate coloured materials for structures to blend in with the backdrop of the area where this is technically feasible and where the colour or paint will not negatively affect the functionality of the structures.
- Maintain painted features and repainted when colours fade or paint flakes.
- Choose materials, coatings and paints with minimum reflectivity where possible.
- Paint grouped structures the same colour to reduce colour contrast.
- Construct powerline towers to be similar to those already existing in the landscape, where possible.

Significance of impact

Before mitigation	With mitigation
Moderate	Moderate

ESTABLISHED INFRASTRUCTURE:
CONTRASTING SOLAR FIELD INFRASTRUCTURE

Project phases

- Operation.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *established infrastructure* may have a local impact. The probability of the impact of contrasting solar field infrastructure is very likely and the consequence moderate. The disturbance is expected to be of long-term duration – during the operation phase.

Proposed mitigation measures

- Use appropriate coloured materials for structures to blend in with the backdrop of the area where this is technically feasible and where the colour or paint will not negatively affect the functionality of the structures.
- Maintain painted features and repainted when colours fade or paint flakes.
- Choose materials, coatings and paints with minimum reflectivity where possible.
- Paint grouped structures the same colour to reduce colour contrast.

Significance of impact

Before mitigation	**With mitigation**
Moderate	Moderate

6.8 Cumulative impacts

CUMULATIVE IMPACTS

Project phases

- Construction.
- Operation.
- Decommissioning.

Nature of the impact

Visual intrusion to the views of sensitive visual receptors due to *cumulative impacts of many solar PV facilities and electricity infrastructure* may have a regional impact. The probability of cumulative impact is very likely, and the consequence moderate. The disturbance is expected to be of long-term duration.

The DEA has indicated, due to the impact to the SKA, it envisages that no more than six approved renewable energy developments will be awarded preferred bidder status in this area. This VIA was based on the precautionary approach and assumes that all projects will be developed (i.e. 'worst case scenario') within the area for the cumulative impact assessment. However, the cumulative visual impact to the views of sensitive visual receptors is dependent on both *where* projects are located, and on *how many* are present. For example, several projects clustered within close proximity of each other may have an overlapping viewshed and smaller visual "footprint" than fewer projects that area spread out which may have a larger overall visual "footprint". The visual "footprint" of the juwi Skeerhok PV development largely overlap with those of the proposed Scatec and Mulilo developments, and extend the cumulative visual 'footprint' towards the north.

A cluster of ten approved 75 MW PV developments (Mulilo and Scatec) are proposed directly towards the south-west of the proposed juwi Skeerhok PV development. Although construction on these proposed developments has not yet commenced, it is reasonable to assume that they will be constructed in the future (5 – 10 years). Since these projects have all received EA, it is also assumed that the potential changes to the current landscape character and impacts to visual receptors have been deemed acceptable to I&APs that participated in the EIAs for the aforementioned approved projects. The approval of these solar PV developments and the construction of high-voltage electricity infrastructure (e.g. the Eskom Nieuwehoop Substation and associated 400kV powerlines) in the direct surroundings of the project area, together with the Saldanha-Sishen railway with overhead powerlines, contribute to the degradation of the rural pastoral character of the surrounds.

Proposed mitigation measures

- Adequate implementation of proposed mitigation measures and best practice to reduce visual impacts by all solar PV facilities in the vicinity.

Significance of impact

Before mitigation	**With mitigation**
Moderate	Moderate

7. IMPACT ASSESSMENT SUMMARY

The assessment of impacts and recommended mitigation measures, as discussed in Section 6, are collated in

Table 6 -

Table 9.

Table 6: 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)		
Clearance of vegetation for solar field, laydown areas, buildings and roads	VISUAL INTRUSION TO VIEWS SENSITIVE OF VISUAL RECEPTORS	Negative	Local	Short-term	Substantial	Very Likely	Moderate	Low	- Minimise the footprint of cleared vegetation. - Phased clearance of the area for solar field in order to reduce the amount and duration of bare soil exposure. - Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. - Commence with restoration of disturbed, cleared land as soon as possible. - Maintain rehabilitated surfaces until vegetation is established, sustainable and blends well with surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Control Officer (ECO).	**Moderate**	**Low**	4	High
Increased traffic		Negative	Local	Long-term	Moderate	Likely	High	Low	- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time - Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only	**Moderate**	**Low**	4	High
Night lighting		Negative	Regional	Long-term	Moderate	Likely	High	Low	- Develop a lighting plan that: - documents the design, layout and technology used for lighting; - indicates how nightscape impacts will be minimised; - includes a process for quick and effective resolution of lighting complaints; and - Do not exceed the minimum lighting requirement for effective safety and security. - Minimise bright light (uplighting and glare) with appropriate screening. - Reduce light pollution through the use of low-pressure sodium light sources. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Avoid light spilling beyond the project boundary. - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting. - Switch off lights when not in use.	**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: Without Mitigation/ Management	Significance of Impact and Risk: With Mitigation/ Management (Residual Impact/ Risk)	Ranking of Residual Impact/ Risk	Confidence Level
Dust		Negative	Local	Short-term	Slight	Very Likely	Very high	Low	- Implement standard construction site dust control methods (i.e. dampening with water) as required.	**Low**	**Very Low**	5	High
Veld fires		Negative	Local	Long-term	Slight	Unlikely	Very high	Low	- Implement fire risk reduction and containment measures, including: - worker awareness; - designated, safe smoking areas; - fire breaks; and - appropriate and working firefighting equipment.	**Low**	**Very Low**	5	High

Table 7: Impact assessment summary table for the operation phase.

OPERATION 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: Without Mitigation/ Management	Significance of Impact and Risk: With Mitigation/ Management (Residual Impact/ Risk)	Ranking of Residual Impact/ Risk	Confidence Level
Increased traffic	**VISUAL INTRUSION TO VIEWS SENSITIVE OF VISUAL RECEPTORS**	Negative	Local	Long-term	Moderate	Likely	High	Low	- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak. - Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only.	**Moderate**	**Low**	4	High
Night lighting		Negative	Regional	Long-term	Moderate	Likely	High	Low	- Develop a lighting plan that: - documents the design, layout and technology used for lighting; - indicates how nightscape impacts will be minimised; - includes a process for quick and effective resolution of lighting complaints; and - Do not exceed the minimum lighting requirement for effective safety and security. - Minimise bright light (uplighting and glare) with appropriate screening. - Reduce light pollution through the use of low-pressure sodium light sources. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Avoid light spilling beyond the project boundary. - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting. - Switch off lights when not in use.	**Low**	**Very Low**	5	High
Established infrastructure • **Vertical electrical infrastructure** • **Contrasting solar field infrastructure**		Negative	Local	Long-term	Moderate	Very Likely	Moderate	Low	- Use appropriate coloured materials for structures to blend in with the backdrop of the area where this is technically feasible and where the colour or paint will not negatively affect the functionality of the structures. - Maintain painted features and repainted when colours fade or paint flakes. - Choose materials, coatings and paints with minimum reflectivity where possible. - Paint grouped structures the same colour to reduce colour contrast. - Construct powerline towers to be similar to those already existing in the landscape, where possible.	**Moderate**	**Moderate**	4	High

Table 8: Impact assessment summary table for the decommissioning phase.

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)		
Clearance of vegetation for solar field, laydown areas, buildings and roads	**VISUAL INTRUSION TO VIEWS SENSITIVE OF VISUAL RECEPTORS**	Negative	Local	Short-term	Substantial	Very Likely	Moderate	Low	- Minimise the footprint of cleared vegetation. - Phased clearance of the area for solar field in order to reduce the amount and duration of bare soil exposure. - Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. - Commence with restoration of disturbed, cleared land as soon as possible. - Maintain rehabilitated surfaces until vegetation is established, sustainable and blends well with surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Control Officer (ECO).	**Moderate**	**Low**	4	High
Increased traffic		Negative	Local	Long-term	Moderate	Likely	High	Low	- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time. - Demarcate and strictly control permitted roads for use and parking areas so that vehicles are limited to specific areas only	**Moderate**	**Low**	4	High
Night lighting		Negative	Regional	Long-term	Moderate	Likely	High	Low	- Develop a lighting plan that: - documents the design, layout and technology used for lighting; - indicates how nightscape impacts will be minimised; - includes a process for quick and effective resolution of lighting complaints; and - Do not exceed the minimum lighting requirement for effective safety and security. - Minimise bright light (uplighting and glare) with appropriate screening. - Reduce light pollution through the use of low-pressure sodium light sources. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Avoid light spilling beyond the project boundary. - Install timer switches or motion sensors to control the lighting of areas that do not require constant lighting. - Switch off lights when not in use.	**Low**	**Very Low**	5	High
Dust		Negative	Local	Short-term	Slight	Very Likely	Very high	Low	- Implement standard construction site dust control methods (i.e. dampening with water) as required.	**Low**	**Very Low**	5	High

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)		
Veld fires		Negative	Local	Long-term	Slight	Unlikely	Very high	Low	- Implement fire risk reduction and containment measures, including: - worker awareness; - designated, safe smoking areas; - fire breaks; and - appropriate and working firefighting equipment.	**Low**	**Very Low**	5	High

Table 9: Impact assessment summary table for cumulative impacts.

CUMULATIVE 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 Impacts	**VISUAL INTRUSION TO VIEWS SENSITIVE OF VISUAL RECEPTORS**	Neutral	Regional	Long-term	Moderate	Very Likely	High	Low	- Adequate implementation of proposed mitigation measures and best practice to reduce visual impacts by all solar PV facilities in the vicinity.	**Moderate**	**Moderate**	4	High

8. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

The mitigation and management recommendations outlined in Section 6 should be included in the EMPr. Implementation of the recommended mitigation and management actions, for all development phases, should be monitored and reported on by the ECO. Furthermore, it important to educate workers on-site and raise awareness to the issues and required actions highlighted in this report.

9. CONCLUSION AND RECOMMENDATIONS

This document constitutes the VIA as part of the EIA, and draws on VIAs conducted for other solar PV developments in the direct vicinity of the juwi Solar PV development.

The changes to the landscape character that may be brought about by the proposed juwi Skeerhok PV development can have impacts on the views of potential sensitive visual receptors. However, the existing approvals for solar PV developments, the construction of high-voltage electricity infrastructure in the direct surroundings of the project area, and the Saldanha-Sishen railway with overhead powerlines entails that an industrial/electrical character has encroached on the rural / pastoral landscape. Furthermore, the landscape sensitivity, as determined by the SEA which informed the REDZ, is classified as low from a visual, scenic, aesthetic and amenity perspective.

A Viewshed Analysis was conducted using ArcMap 10.5 software (Esri, 2017). The height of the tallest structure on site, and the boundary of the farm portions on which the juwi Skeerhok PV development is proposed was used as the extent of the development, was used to simulate 'worst case' conditions. Due to the flat terrain the zone of visibility is extensive. However, limited potentially sensitive visual receptors exist.

The impact of visual intrusion to the views of potential sensitive visual receptors is expected to be moderate to low (before mitigation) and moderate to very low with the effective implementation of the mitigation and management actions outlined in this report. The impacts vary depending on the impact pathway being assessed.

Due to the existing landscape character, and foreseeable trend of renewable energy and associated electricity infrastructure development in the area, the cumulative impacts to the views of potential sensitive visual receptors are expected to be moderate, if all solar PV developments implement proposed mitigation measures and best practice to reduce visual impacts.

Based on the findings in this VIA it has been concluded that the juwi Skeerhok PV development, including its associated electricity infrastructure, from a visual, scenic, aesthetic and amenity perspective, may receive EA with adherence to the mitigation and management measures set out in this report.

10. REFERENCES

ASHA Consulting. 2018. Heritage Impact Assessment: Scoping and Environmental Impact Assessment for the proposed development of the Skeerhok PV1 solar energy facility on Smutshoek 395/remainder, Kenhardt magisterial district, Northern Cape Province

Council for Scientific and Industrial Research (CSIR). 2016a. Scoping and Environmental Impact Assessment for the proposed Development of a 75 MW Solar Photovoltaic, north-east of Kenhardt, Northern Cape Province. Mulilo Renewable Project Developments. CSIR Report number: CSIR/CAS/EMS/ER/2015/0017/B

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SiVEST
Established 1952

Council for Scientific and Industrial Research
PO Box 320
Stellenbosch
7599

Your reference
Our reference 14941
Date 07 February 2018

ATTENTION: Kelly Stroebel

Dear Kelly

EXTERNAL PEER REVIEW OF THE VISUAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF THREE 100 MW SOLAR PHOTOVOLTAIC FACILITIES (SKEERHOK PV 1, PV 2, & PV 3) NEAR KENHARDT IN THE NORTHERN CAPE PROVINCE

The Council for Scientific and Industrial Research (CSIR) was appointed by juwi Renewable Energies to undertake the Environmental Impact Assessment (EIA) for the proposed development of three 100 MW Solar Photovoltaic (PV) Facilities and the associated infrastructure near Kenhardt in the Northern Cape Province. As part of the EIA process an in-house Visual Impact Assessment (VIA) was undertaken by the CSIR, and as a result this VIA report needs to be reviewed by an external visual specialist.

This letter outlines the findings of the external peer review which was undertaken by SiVEST SA (Pty) Ltd for the following report:

- Snyman-van der Walt, L. 2018. Visual Impact Assessment: Scoping and Environmental Assessment for the proposed development of three 100 MW Solar Photovoltaic Facilities (Skeerhok PV 1, PV 2, PV 3) near Kenhardt in the Northern Cape Province. CSIR: Stellenbosch. (Draft VIA_v2_juwvi Skeerhok_25Jan2018)

1. Review Summary

The review was based on SiVEST's experience and knowledge of undertaking VIAs, the requirements stipulated in Appendix 6 of the of the EIA Regulations 2014 (as amended) and the requirements stipulated by the Department of Environmental Affairs (DEA) as outlined in the table below.

DEA Peer Review Requirements	Peer Reviewer Response
A CV clearly showing expertise of the peer reviewer.	A CV of the peer reviewer is attached to this letter.
Acceptability of the terms of reference.	The terms of reference is considered acceptable, however the limitations of undertaking a desktop assessment should be noted within the report.

Is the methodology clearly explained and acceptable.	The methodology is acceptable, however the limitations of undertaking a desktop assessment should be noted within the report. In addition, the methodology should also explain the sensitivity assessment, assessment of impacts and identification of management actions.
Evaluate the validity of the findings.	Most of the findings are considered to be valid however the following is noted and should be addressed: ▪ SiVEST disagrees with the statement that "*the existing landscape has an industrial / electrical character*". This should be reworded to note that the existing landscape has a rural / pastoral visual character which has been transformed by existing infrastructure. ▪ The impacts of the electrical infrastructure and solar facility should not be rated together, but should be assessed separately. ▪ SiVEST disagrees that the potential impact of the *Established Infrastructure* can be rated as *low* with the implementation of mitigation measures. This should be changed to be *medium*. ▪ SiVEST disagrees that the potential *Cumulative Impact* can be rated as *low* with the implementation of mitigation measures. This should be changed to be *medium*.
Discuss the suitability of the mitigation measures and recommendations.	The mitigation measures and recommendations described are acceptable.
Identify any short comings and mitigation measures to address the short comings.	Additional mitigation measures have been recommended. These include: ▪ Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. ▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill.
Evaluate the appropriateness of the reference literature.	The reference literature is considered to be appropriate. It should just be ensured that all literature is referenced in the text and included within the list of references.
Indicate whether a site-inspection was carried out as part of the peer review.	No site visit was undertaken for the peer review.
Indicate whether the article is well-written and easy to understand	The report supplied to SiVEST is considered well written and easy to understand.

General recommendations for improving the report were also provided as comments within the report and these include but are not limited to the following:

- Inclusion of a brief project description section with a map showing the layout of the proposed PV facility and power line routes.
- Section 2 *Description of the Affected Environment* should be more applicable to the visual environment.

- Inclusion of a visual character and cultural landscape section that clarifies the visual character within the area.
- Define the visual assessment zone / affected project area.

SiVEST is of the opinion that overall the VIA report compiled by the CSIR was unbiased and fair and that the methodology used was transparent. Provided the suggested changes are made to the report the findings are considered valid and the mitigation measures are appropriate.

Should you have any queries or comments regarding the peer review, please do not hesitate to contact Andrea Gibb on 011 798 0600.

Yours sincerely

Andrea Gibb
Senior Manager
SiVEST Environmental

encl: CV of Peer Reviewer

CURRICULUM VITAE

Name	Andrea Gibb
Profession	Environmental Practitioner
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Senior Manager Environmental Division
Years with Firm	7 Years
Date of Birth	29 January 1985
ID Number	8501290020089
Nationality	South African

Education

Matriculated 2003, Full Academic Colours, Northcliff High School, Johannesburg, South Africa

Professional Qualifications

BSc (Hons) Environmental Management (University of South Africa 2008-2010)
Coursework: Project Management, Environmental Risk Assessment and Management, Ecological and Social Impact Assessment, Fundamentals of Environmental Science, Impact Mitigation and Management, Integrated Environmental Management Systems & Auditing, Integrated Environmental Management, Research Methodology.
Research Proposal: Golf Courses and the Environment

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
Coursework: Core modules focused on; design, construction, environmental science, applied sustainability, shifts in world paradigms and ideologies, soil and plant science, environmental history, business law and project management.
Awards: Cave Klapwijk prize for highest average in all modules in the Landscape Architecture programme, ILASA book prize for the best Landscape Architecture student in third year design, Johan Barnard planting design prize for the highest distinction average in any module of plant science.

ArcGIS Desktop 1 (ESRI South Africa December 2010)
Environmental Impact Assessment (EIA) 2014 Legal Regime Workshop (Imbewu 2015)

Employment Record

Aug 2010 – to date	SiVEST SA (Pty) Ltd: Environmental Practitioner
Jan 2008 – July 2010	Cave Klapwijk and Associates: Environmental Assistant and Landscape Architectural Technologist
Feb 2006 – Dec 2006	Cave Klapwijk and Associates: Part time student

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Specialising in the field of Environmental Management and Visual Assessment.

Andrea has 10 years' work experience and is employed by SiVEST Environmental as the Senior Manager heading up the Johannesburg office. She is primarily involved with managing large scale multifaceted Environmental Impact Assessments (EIAs) and Basic Assessments (BAs) (incl. Amendment Applications), undertaken according to International Finance Corporation (IFC) standards and Equator Principles, within the renewable energy generation and electrical distribution sectors. Andrea has extensive experience in overseeing public participation and stakeholder engagement processes and has also been involved in environmental feasibility and sensitivity analyses. She further specialises in undertaking and overseeing visual impact and landscape character assessments.

Skills include:

- Project Management (MS Project)
- Environmental Impact Assessment (EIA)
- Basic Assessment (BA)
- Public Participation Management
- Visual Impact Assessment (VIA)
- Landscape Assessment
- Strategic Environmental Planning
- Documentation / Quality Control
- Project Level Financial Management

Projects Experience

Aug 2010 – to date

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) / BASIC ASSESSMENT (BA)

- EIA for the proposed construction of the Grasskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the Droogfontein II PV Plant near Kimberley, Northern Cape Province.
- Amendment and Resubmission of the FBAR for the Eskom Longdown Substation and Vyeboom 66kV Turn-in Power Lines near Villiersdorp, Western Cape Province.
- BA for the proposed construction of the Leeuwbosch Power Plant near Leeudoringstad, North West Province.
- BA for the proposed construction of the Wildebeestkuil Power Plant near Leeudoringstad, North West Province.
- EIA for the proposed development of the Tlisitseng 1 and 2 75MW Solar Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- EIAs for the proposed development of the Sendawo 1, 2, and 3 75MW Solar PV Energy Facilities near Vryburg, North West Province.
- EIA for the proposed construction of the Sendawo Common Collector Substation and power line near Vryburg, North West Province.
- EIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.

- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the 100MW Limestone Solar Thermal Power Project near Danielskuil, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of three 75MW solar PV facilities near Prieska, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of the 75MW Arriesfontein and Wilger Solar Power Plants near Danielskuil, Northern Cape Province.
- Completion and submission of the final EIA report for the proposed Rooipunt PV Solar Power Park Phase 1 and proposed Rooipunt PV Solar Power Park Phase 2 near Upington, Northern Cape Province.
- EIAs for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- EIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed Construction of the SSS1 5MW Solar PV Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Construction of the SSS2 5MW Solar PV Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- Amendment of the Final Environmental Impact Report for the Proposed Mookodi 1 Integration Project near Vryburg, North West Province.
- BA for the proposed 132kV power line and associated infrastructure for the proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province.
- BA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province.
- Application for an Amendment of the EA to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province.
- BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province.
- BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province.
- Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province.
- EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province.

- Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province.
- Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.

VISUAL IMPACT ASSESSMENT (VIA)

- VIA for the proposed construction of the Grasskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province.
- VIA for the proposed San Kraal Wind Energy Facility near Noupoort, Northern Cape Province
- VIA for the proposed Assagay Valley Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Kassier Road North Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces.
- VIA (Scoping Phase) for the proposed construction of a 3000MW Wind Farm and associated infrastructure near Richmond, Northern Cape Province.
- VIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- VIAs (Impact Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.
- VIA (Impact Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIAs (Impact Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- VIA for the proposed construction of the Tlisitseng substation and associated 132kV power line near Lichtenburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- Visual recommendations for Phase 1 of the proposed Renishaw Estate Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Tinley Manor South Banks Development, KwaZulu-Natal Province.
- VIAs (Impact Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- VIA (Scoping Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- Visual Due Diligence Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- Visual Status Quo and Constraints Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- VIA for the proposed agricultural components of the Integrated Sugar Project in Nsoko, Swaziland.

- VIA for the proposed Tweespruit to Welroux power lines and substation, Free State Province.
- VIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- VIA (Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed amendment to the authorised power line route from Hera Substation to Westgate Substation, Gauteng Province.
- VIA (Impact Phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South Coast of KwaZulu Natal.
- VIA (Scoping Phase) for the proposed construction of a Coal-fired Power Station, Coal Mine and Associated Infrastructure near Colenso, KwaZulu-Natal Province.
- VIA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- VIA for the proposed construction of the Duma transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Madlanzini transmission substation and associated Eskom power lines, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Normandie substation to Hlungwane substation, Mpumalanga and KwaZulu-Natal Provinces.
- VIA for the proposed construction of the Nzalo transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Sheepmoor traction substation with two 20MVA transformer bays and a new associated 88kV turn-in power line, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Uitkoms substation to Antra T-off, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Umfolozi substation to Eqwasha traction substation including an 88kV turn-in power line to Dabula traction substation, Kwazulu-Natal Province.
- VIA for the proposed construction of the new 88/25kV Vryheid traction substation with two 20MVA transforma bays and a new associated 88kV turn-in power line, KwaZulu-Natal Province.
- VIA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- VIA (Impact Phase) for the proposed Construction of a Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Wind Farm near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the proposed construction of a 132kV power line for the Redstone Thermal Energy Plant near Lime Acres, Northern Cape Province.
- VIA for the proposed Mookodi Integration phase 2 132kV power lines and Ganyesa substation near Vryburg, North West Province.
- VIA for the proposed 132kV power lines associated with the PV Plants on Droogfontein Farm near Kimberley, Northern Cape Province.
- VIA (Scoping phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.

- VIA for the proposed development of a learning and development retreat and an executive and staff lodge at Mogale's Gate, Gauteng Province.
- VIA for the proposed construction of a substation and 88kV power line between Heilbron (via Frankfort) and Villiers, Free State Province.
- Visual Status Quo Assessment for the Moloto Development Corridor Feasibility Study in the Gauteng Province, Limpopo Province and Mpumalanga Province.
- VIA the West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- VIA for the proposed construction of a wind farm and solar photovoltaic plant near Loeriesfontein, Northern Cape Province.
- Visual sensitivity mapping exercise for the proposed Mogale's Gate Expansion, Gauteng.
- VIA (Scoping Phase) for the proposed Renosterberg Solar PV Power Plant and Wind Farm near De Aar, Northern Cape Province.
- Scoping level VIAs for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- VIAs for the Spoornet Coallink Powerline Projects in KZN and Mpumalanga.
- Visual Constraints Analysis for the proposed establishment of four Wind Farms in the Eastern and Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in De Aar, Northern Cape.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in Kimberley, Northern Cape.

STRATEGIC ENVIRONMENTAL PLANNING

- Assistance with the Draft Environmental Management Framework for the Mogale City Local Municipality, Gauteng Province.
- Sensitivity Negative Mapping Analysis for the proposed Mogale's Gate Development, Gauteng Province.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX N:

1. Soils and Agricultural Impact Statement
2. Traffic Impact Statement
3. Social Impact Statement

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX N1:

Soils and Agricultural Impact Statement

Statement prepared by:	*Statement reviewed by*:
CSIR – Environmental Management Services PO Box 320 Stellenbosch, 7599 South Africa	Johann Lanz – Soil Scientist P.O. Box 6209 Stellenbosch, 7599 South Africa

December 2017

<u>Cover letter: Review of Soils and Agricultural Impact Statement</u>

I hereby confirm that I have reviewed the Soils and Agricultural Impact Statement for the Skeerhok solar energy projects, which was prepared by the CSIR, and agree with its contents, conclusions and recommendations.

Johann Lanz (Pri.Sci.Nat)

26/01/2018

CONTENTS

Tables

Figures

SOILS AND AGRICULTURAL POTENTIAL IMPACT STATEMENT

1 INTRODUCTION

juwi Renewable Energies (PTY) Ltd is proposing to develop three 100 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (132 kV transmission lines for each 100 MW facility) on Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult 120, and the connection points to the Eskom Nieuwehoop Substation on the Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province.

As per the Plan of Study included in Final Scoping Report (September 2017) and subsequently approved by the Department of Environmental Affairs (DEA) on 30 November 2017, it was indicated that **a Soils and Agriculture Impact Statement** will be produced to identify potential impacts of the proposed development on agricultural resources including soils and agricultural production potential for the proposed Skeerhok PV 1, Skeerhok PV 2, and Skeerhok PV 3 solar energy projects, as well as the proposed Skeerhok PV – Transmission Line Basic Assessment project near Kenhardt in the Northern Cape.

Various projects have been approved within the same area as the proposed Skeerhok PV facilities (see map below, Figure 1) and all the previous Environmental Impact Assessments (EIAs) included Soils and Agricultural Potential Studies. There is therefore a large amount of existing information on the soils and agriculture potential of the area and therefore, the impacts of solar PV facilities on soils and agricultural is well known and documented. For this reason, it was proposed that a full specialist impact assessment is not deemed necessary for these projects.

This impact statement has been compiled by the CSIR using existing information and reviewed by Mr Johann Lanz. The studies used as a reference for this impact statement are listed in Section 3.7 below.

1.1 Terms of Reference

The Impact Statement includes the following considerations:

- The identification of any significant soils and agricultural features or disturbances, as well as any sensitive features and receptors in the wider project area;
- Assessment of the existing soil and agricultural potential data for the wider project area;
- Environmental risks to the soils and agricultural land and potential, as well as the consequences thereto;
- Topography of the site;
- Available water sources for agriculture;
- Historical and current land use, agricultural infrastructure, as well as possible alternative land use options;
- Erosion, vegetation and degradation status of the land;
- Agricultural sensitivity to development across the site.

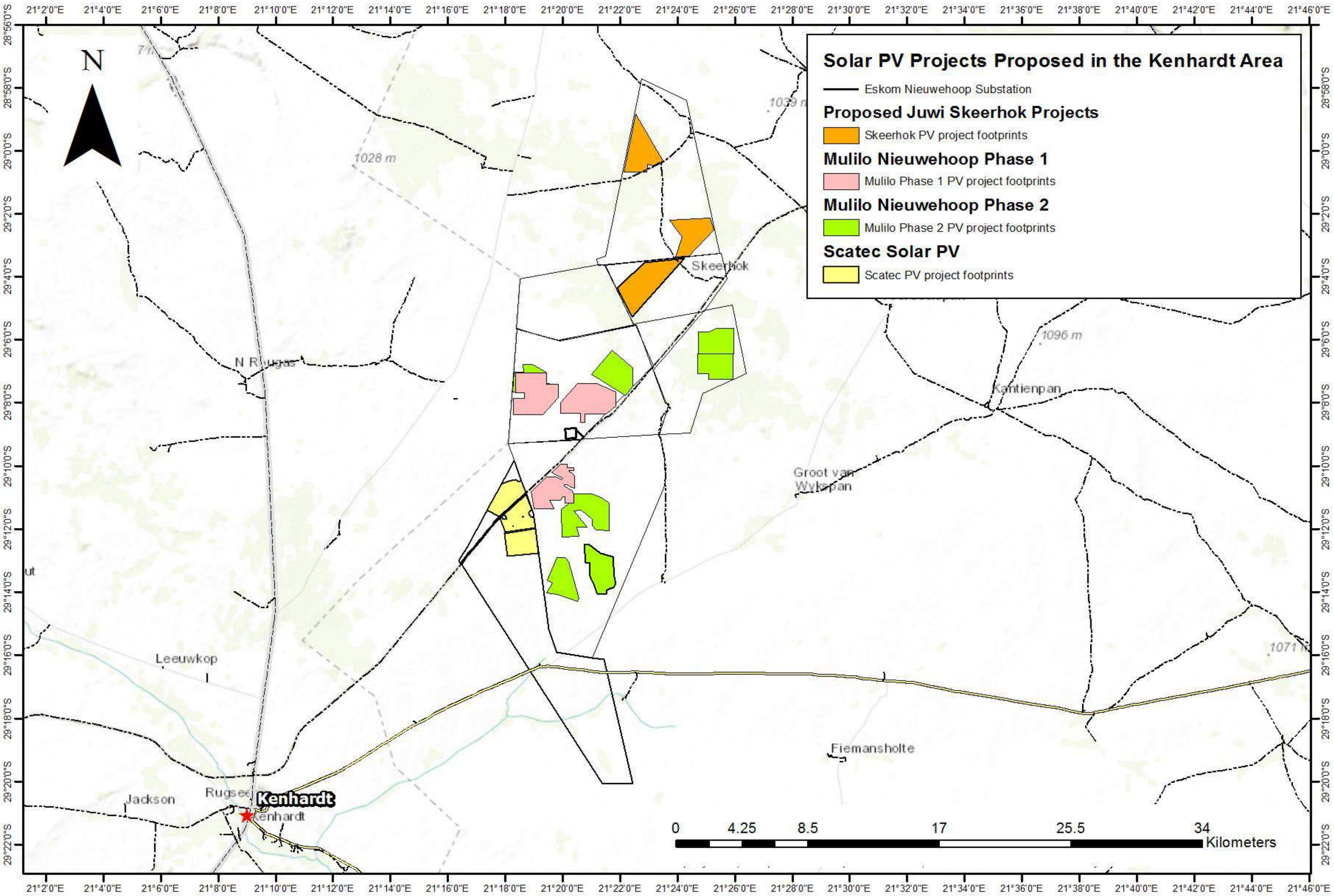

Figure 1: Cumulative locality map for the proposed three juwi Skeerhok Solar PV Projects, and the two reference studies (three Scatec Kenhardt Solar PVs and seven Mulilo Kenhardt Solar PVs) near Kenhardt in the Northern Cape.

1.1.1 Assumptions and Limitations

This impact statement has been based on soils and agricultural studies that have been done for other renewable energy projects in the immediate area of this proposed project. The following assumptions were used in this impact statement:

- It was assumed that water is not available anywhere on the site for irrigation. Given the very severe moisture constraints of the environment and that no suitable water has ever been identified by farmers in the area, this is a fair assumption; and
- The cumulative impact assessment assumes that a total of **six** approved renewable energy developments will be awarded preferred bidder status in the surrounding area, as stipulated by the DEA within the Scatec Environmental Authorization letter for 14/12/16/3/3/2/837, "Conditions of this Environmental Authorization", Scope of Authorization, Point 2 (07/08/2017).

The following limitations were identified in this study:

- Soils were not mapped in detail for the project area. However detailed soil mapping has little relevance to an assessment of agricultural potential in this environment, as the limitations are overwhelmingly climatic. In other words, even where soils suitable for cultivation may occur, they cannot be utilised because of the aridity constraints. The study had more than sufficient information on the soils to make an assessment on the impacts of the development on agriculture, and so this is not seen as a limitation; and
- The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

2 METHODOLOGY

The key steps followed in this assessment are:

- Review of available desktop information, including the soils and agricultural specialist studies mentioned above for similar projects; and
- Existing Agricultural Geo-Referenced Information System (AGIS) data, as well as satellite imagery for the site.

The Final Scoping Report was submitted to the National DEA on 3 November 2017 for decision-making. The Scoping Report was accepted by the National DEA on 30 November 2017. As part of the acceptance, the National DEA had the certain requirements for the Soils and Agricultural Potential Impact Statement, as shown in Table 1 below.

Table 1: National DEA Requirements for the Soils and Agricultural Potential Impact Statement (Acceptance of Scoping letter – 30 November 2017)

DEA Requirement	Feedback from Specialist/sub-section where this is addressed
x. The specialist input referred to in comment (viii) of the comments on the draft scoping report signed 19 October 2017; must additionally address the following:	

DEA Requirement	Feedback from Specialist/sub-section where this is addressed
• indicate whether the recommendation by the EAP that detailed studies are not required is acceptable;	Yes, the recommendation is acceptable.
• indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable;	Yes this is adequately explained in Section 1 and is acceptable.
• Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated;	Suitable mitigation measures and monitoring requirements are comprehensively given in Section 3.4 of the report.
• Evaluate the appropriateness of the reference literature used;	The reference literature is appropriate and adequate.
• Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input	No site inspection was carried out for the impact statement for this proposed project, however, the reference studies conducted by Johann Lanz (2016) included site inspection(s). Please refer to Section 2 below for a description of the methodology used in the reference studies.
• Indicate if the studies being referred to covers the preferred site; and	Although the proposed Skeerhok PV 1, 2 and 3 cover different development footprints compared to the reference studies, they are in extremely close proximity and are on the same greater farms. Thus the land use is similar and the impacts can be extrapolated. See locality map above (Figure 1).
• Provide an indication on the cumulative impacts of these studies in relation to the proposed development.	Refer to Section 3.4.3 and Table 1.3 below.
• Must be conducted or input provided on by a suitably qualified specialist in the field	Refer to Appendix A for the full CV of the specialist.

3 AFFECTED ENVIRONMENT

3.1 Climate and Water Availability

Rainfall for the area is given as a very low 183 mm per annum, with a standard deviation of 71 mm according to the South African Rain Atlas (Water Research Commission, undated). 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 six categories across the country, the proposed development site falls within Class 6, which is described as a very severe limitation to agriculture.

Water for stock is obtained from wind pumps on the farms in the area. There is insufficient water available for any form of irrigation.

3.2 Terrain, Topography and Drainage

The proposed development is located on level plains with some relief in the Northern Cape interior at an altitude of between 900 and 1000 meters. Slopes across the site are almost entirely less than 2%. The underlying geology is migmatite, gneiss and granite of the Namaqualand Metamorphic Complex with abundant calcrete.

There are no perennial drainage courses within the proposed Skeerhok PV 1, 2 and 3 project areas. There are temporary drainage courses, typical of arid environments, where surface run-off would accumulate and flow, but this would only occur very occasionally, immediately after high rainfall events.

3.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The proposed Skeerhok developments are located on a single land type, Ag5. This land type comprises 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). The field investigation (Lanz, 2016) confirmed that the soils in the area 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). The land has low to moderate water erosion hazard, mainly due to the low slope, but is susceptible to wind erosion because of the sandy texture of the soil.

3.4 Agricultural Capability

Land capability is the combination of soil suitability and climate factors. The area has a land capability classification, on the eight category scale, of Class 7 - non-arable, low potential grazing land. The limitations to agriculture are aridity and lack of access to water in addition to 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. The current farmer uses an average stocking rate of 10 hectares per sheep.

3.4.1 Land Use and Development on and Surrounding the Site

The proposed sites (Skeerhok PV 1, 2 and 3, and Skeerhok – transmission line) are located within a sheep farming agricultural region and land use for the farm and surrounding area is sheep farming only. There is no cultivation or any history of cultivation on the farm. The Sishen-Saldanha railway line with its associated infrastructure runs through the farm to the south of the PV site. Apart from fences and one stock watering point, there is no agricultural infrastructure on the site. There are no buildings on the site.

3.4.2 Status of the Land

The biome classification for the site is Bushmanland Arid Grassland. The natural vegetation is grazed, veld conditions are very sparse but there is no evidence of significant erosion or other land degradation on the site.

3.4.3 Possible Land Use Options for the Site

Because of both the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing.

The site is within one of South Africa's eight proposed Renewable Energy Development Zones (REDZs), and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors. These factors include an assessment of the significance of the loss of agricultural land. Renewable energy development is therefore a very suitable land use option for the site.

3.4.4 Agricultural Sensitivity

Agricultural potential is uniformly low across the farms in the area and the choice of placement of the facility on the chosen farms therefore has no influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the assessed area, and so no parts of it need to be avoided by the development. No buffers are required.

3.5 Key Issues and Potential Impacts

The following have been identified by the specialist (Lanz, 2016) as potential impacts on agricultural resources and productivity for projects in the proposed Skeerhok PV area.

3.5.1 Construction and Decommissioning Phases only

1. Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to construction and decommissioning disturbance and potential trampling by vehicles.
2. Loss of topsoil due to poor topsoil management (burial, erosion, etc.) during construction and decommissioning related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's capability for supporting vegetation.

3.5.2 All Phases – Construction, Operation and Decommissioning

1. Loss of agricultural land use due to direct occupation by the infrastructural footprint of the proposed development for the duration of the project (all phases). This will take affected portions of land out of agricultural production.
2. Soil erosion by wind or water due to alteration of the land surface characteristics. Alteration of surface characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas, surfaces and roads. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.

3. Generation of additional land use income through the rental of the land for the proposed solar energy facility. This will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve its financial sustainability. This is rated as a positive impact.

3.5.3 Cumulative Impacts

Cumulative impacts due to the regional loss of agricultural land resources as a result of other developments on agricultural land in the region. Note that the cumulative impact assessment will take into account the presence of **6 approved renewable energy facilities** to receive preferred bidder status by the DoE.

3.6 Assessment of Impacts and Identification of Management Actions

The potential impacts identified are assessed in table format in Tables 2 and 3 below.

The proposed developments are located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable and important for agricultural production. The proposed site is however on land which has very low agricultural potential and is only suitable for low intensity grazing.

All impacts are evaluated in terms of their consequence for agricultural production, not in terms of the impact *per se*. This is because it is agricultural production that must be the focus of an agricultural assessment. Because the undisturbed site already has extremely limited agricultural potential, it means that the consequence of any impact for agricultural production is limited with the result that the consequence and significance of agricultural impacts is low. Furthermore, the poor, very shallow soil conditions reduce the significance of loss of topsoil and the low slope gradients reduce the significance of potential erosion impacts.

Irreplaceability of resources is considered low because the resource that is being impacted is non-arable, low potential grazing land which is not a scarce resource in the country. The confidence level of the assessment is considered high because there is certainty about the low agricultural potential of the land and the impacts are fairly easy to understand and predict. There are a large number of other potential projects in the area that will also lead to a loss of agricultural land. Although the loss of individual project portions of land has low significance, as discussed above, the cumulative impacts of land loss regionally becomes more significant. However, despite this cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to regions such as this one, with very low agricultural potential. It is preferable to incur a higher cumulative loss in such a region, than to lose agricultural land with a higher production potential elsewhere in the country.

Mitigation measures are also included in Table 1.2. Recommendations for the monitoring and review of all identified mitigation measures are described below, as well as the EMPr (Part B of this Draft EIA Report).

Table 2: Impact assessment summary table

Aspect/Impact pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance		Ranking of Residual Impact	Confidence Level
										Without Mitigation	*With Mitigation*		
CONSTRUCTION AND DECOMMISSIONING PHASES (DIRECT IMPACTS)													
Vehicle traffic and dust generation	Veld degradation	Negative	Site	Medium term	Slight	Likely	Moderate (i.e. Partially)	Low	1. Minimize footprint of disturbance. 2. Confine vehicle access on roads only. 3. Control dust generation during construction and decommissioning activities by adopting standard construct site dust control methods (such as dampening surfaces with water), where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.	Very Low	Very Low	5	High
Constructional and decommissioning activities that disturb the soil profile.	Loss of topsoil	Negative	Site	Medium term	Slight	Likely	Moderate (i.e. Partially)	Low	1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	Very Low	Very Low	5	High
CONSTRUCTION, OPERATIONAL AND DECOMMISSIONING PHASES (DIRECT IMPACTS)													
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Long term	Slight	Very Likely	High	Low	None	Very Low	Not applicable	5	High

Aspect/Impact pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance		Ranking of Residual Impact	Confidence Level
										Without Mitigation	*With Mitigation*		
CONSTRUCTION AND DECOMMISSIONING PHASES (DIRECT IMPACTS)													
Change in surface characteristics and surface cover.	Erosion	Negative	Site	Long term	Slight	Likely	Low	Low	Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	Low	Very Low	5	High
Project rental	Additional land use income	Positive	Site	Long term	Slight	Very Likely	High	Low	None	Very Low	Not applicable	5	High

Table 3: Cumulative impact assessment summary table

Aspect/Impact pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance		Ranking of Residual Impact	Confidence Level
										Without Mitigation	*With Mitigation*		
Occupation of the land by the infrastructure of multiple projects	Regional loss of agricultural land	Negative	Regional	Long term	Likely	Likely	Moderate (i.e. Partially)	Moderate	None	Moderate	Not Applicable	3	Low

3.7 Input to the Environmental Management Programme

The following main mitigation measures and monitoring requirements are proposed for inclusion in the EMPr:

- Minimize the footprint of disturbance during construction and decommissioning activities.
- Confine vehicle access to roads only.
- Control dust generation during construction and decommissioning activities by implementing suitable, standard construction site dust control measures.
- Strip and stockpile topsoil from all areas where soil will be disturbed.
- After cessation of disturbance, re-spread topsoil over the surface.
- Dispose of any sub-surface spoil material, generated from excavations, where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

The following main monitoring requirements are proposed for inclusion in the EMPr:

- Undertake a periodic site inspection to verify the occurrence of off-road vehicle tracks surrounding the site.
- Establish an effective record keeping system for each area where soil is disturbed for constructional and decommissioning purposes. Recommendations for the recording system are included in the EMPr (Part B of the EIA Report).
- Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.

3.8 Conclusion and Recommendations

The proposed Skeerhok PV 1, 2 and 3, and Skeerhok PV – Transmission Line developments are on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the investigated site is on land which is of very low agricultural potential and is not suitable for cultivation.

Because of the low agricultural potential of the site, the development should, from an agricultural impact perspective, be authorised. Authorisation is promoted by the fact that the sites falls within a proposed renewable energy development zone, where such land use has been assessed as very suitable in terms of a number of factors, including agricultural impact. It is preferable to incur a loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.

No agriculturally sensitive areas occur within the wider project area and it is therefore assumed (with high confidence) that no part of it is therefore required to be set aside from the development. Because the sites are uniformly low potential, from an agricultural point of view, there is no preferred location or layout within the assessed sites. The following management and mitigation measures should be included in the EMPr:

- Minimize the footprint of disturbance during construction and decommissioning activities.
- Confine vehicle access to roads only.

- Control dust generation during construction and decommissioning activities by implementing suitable, standard construction site dust control measures (i.e. dampening with water) where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.
- Strip and stockpile topsoil from all areas where soil will be disturbed.
- After cessation of disturbance, re-spread topsoil over the surface.
- Dispose of any sub-surface spoil material, generated from excavations, where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

3.9 Information Sources

The information used for the compilation of this impact statement was drawn from the following sources:

1. Lanz, J. (2016). Agricultural and Soils Impact Assessment for proposed Scatec Solar PV Energy Facilities near Kenhardt, Northern Cape Province. Johann Lanz, Stellenbosch.
2. Lanz, J. (2016). Soils and Agricultural Potential Assessment for the proposed Solar Energy Facilities of the Phase 1 and 2 Nieuwehoop Solar PV Park near Kenhardt. Johann Lanz, Stellenbosch.
3. Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).
4. Satellite imagery of the site available on Google Earth was also used for evaluation.

3.10 Declaration of independence of Specialist

Mr Johann Lanz has reviewed this statement. Please refer to Appendix A of this Impact Statement for the Curriculum Vitae of Mr. Johann Lanz and his letter (page 1), which confirms that this impact assessment is suitable for this project and in lines with his previous studies' findings. The declaration of independence by the specialist is provided below:

DECLARATION OF INDEPENDENCE

I, Johann Lanz, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Skeerhok PV 1, 2 and 3, and Skeerhok – Transmission Line Projects, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

JOHANN LANZ
26/01/2018

Appendix A: Curriculum Vitae of the Specialist

Johann Lanz

Curriculum Vitae

Education

M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1999
B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

Soil Science Consultant	**Self employed**	**2002 - present**

I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:

- Soil specialist study inputs to EIA's, SEA’s and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: Aurecon; CSIR; SiVEST; SRK Consulting; Juwi Renewable Energies; Mainstream Renewable Power; Subsolar; Tiptrans; Planscape; Afrimat; Savannah Environmental; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Haw & Inglis.

- Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Vogelfontein Citrus; De Grendel Estate; Zewenwacht Wine Estate; Goedgedacht Olives;, Lourensford Fruit Company; Kaarsten Boerdery; Wedderwill Estate; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.

I have conducted several research projects focused on conservation farming, soil health and carbon sequestration.

Soil Science Consultant	**Agricultural Consultors International (Tinie du Preez)**	**1998 - end 2001**

Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

Contracting Soil Scientist	**De Beers Namaqualand Mines**	**July 1997 - Jan 1998**

Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX N2:

Traffic Impact Statement

wsp

WSP ref.: 24405

2018/01/23

PUBLIC

Kelly Stroebel, Environmental Assessment Practitioner (EAP)
CSIR Stellenbosch
PO Box 320
Stellenbosch
7599

Dear Madam:

Subject: Review of Skeerhok PV Traffic Impact Statement

This letter confirms that I have reviewed the Skeerhok PV Traffic Impact Statement (TIS) prepared by the CSIR.

I agree with the contents of the TIS.

Yours sincerely,

Digitally signed by Bredenhann, Christo
Date: 2018.01.24 11:25:06 +02'00'

Christo Bredenhann
Associate - Traffic and Transportation Engineer

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wsp.com

Statement prepared by:	*Statement reviewed by*:
CSIR – Environmental Management Services PO Box 320 Stellenbosch, 7599 South Africa	Christo Bredenhann Pr Eng. Associate - Traffic & Transportation Engineer WSP Group Africa (Pty) Ltd Cnr Portswood and Beach Road, Waterfront Cape Town, 8001 South Africa

December 2017

CONTENTS

Tables

Photos

TRAFFIC IMPACT STATEMENT

1 INTRODUCTION

juwi Renewable Energies (PTY) Ltd is proposing to develop three 100 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (132 kV transmission lines for each 100 MW facility) on Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult 120, and the connection points to the Eskom Nieuwehoop Substation on the Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province.

As per the Plan of Study included in Final Scoping Report (September 2017) and subsequently approved by the Department of Environmental Affairs (DEA) on 30 November 2017, it was indicated that a **Traffic Impact Statement (TIS)** will be produced to identify the traffic related potential impacts of the proposed development on the local road network and environment. The TIS will be undertaken for the proposed Skeerhok PV 1, Skeerhok PV 2, and Skeerhok PV 3 solar energy projects, as well as the proposed Skeerhok PV – Transmission Line Basic Assessment project near Kenhardt in the Northern Cape. Various projects have been approved within the same area as the proposed Skeerhok PV facilities (see locality map below, Figure 1) and all the previous Environmental Impact Assessments (EIAs) included Traffic Studies. There is therefore a large amount of information regarding traffic impacts associated with PV projects in the Kenhardt area and these impacts are well known and documented. For this reason, it was proposed that a full specialist impact assessment is not deemed necessary for these projects.

This impact statement has been compiled by the CSIR using existing information and reviewed by Mr. Christo Bredenhann Pr. Eng, a qualified Traffic and Transportation Engineer. The studies used as a reference for this impact statement are listed in Section 7.

1.1 Terms of Reference

The key issues associated with the construction and operational phases of the project that will be assessed as part of the TIS are:

- Increase in traffic generation throughout the lifetime of the project;
- Decrease in air quality; and
- Increase in road maintenance required.

1.2 Assumptions and Limitations

The TIS has been based on the traffic information provided by similar PV projects in the area, as well as traffic information provided by the Applicant, juwi Renewable Energies.

The cumulative impact assessment assumes that a total of **<u>six</u>** approved renewable energy developments will be awarded preferred bidder status in the surrounding area, as stipulated by the DEA within the Scatec Environmental Authorization letter for 14/12/16/3/3/2/837, “Conditions of this Environmental Authorization”, Scope of Authorization, Point 2 (07/08/2017). However, as a precautionary approach, all developments were included in the cumulative impact assessment.

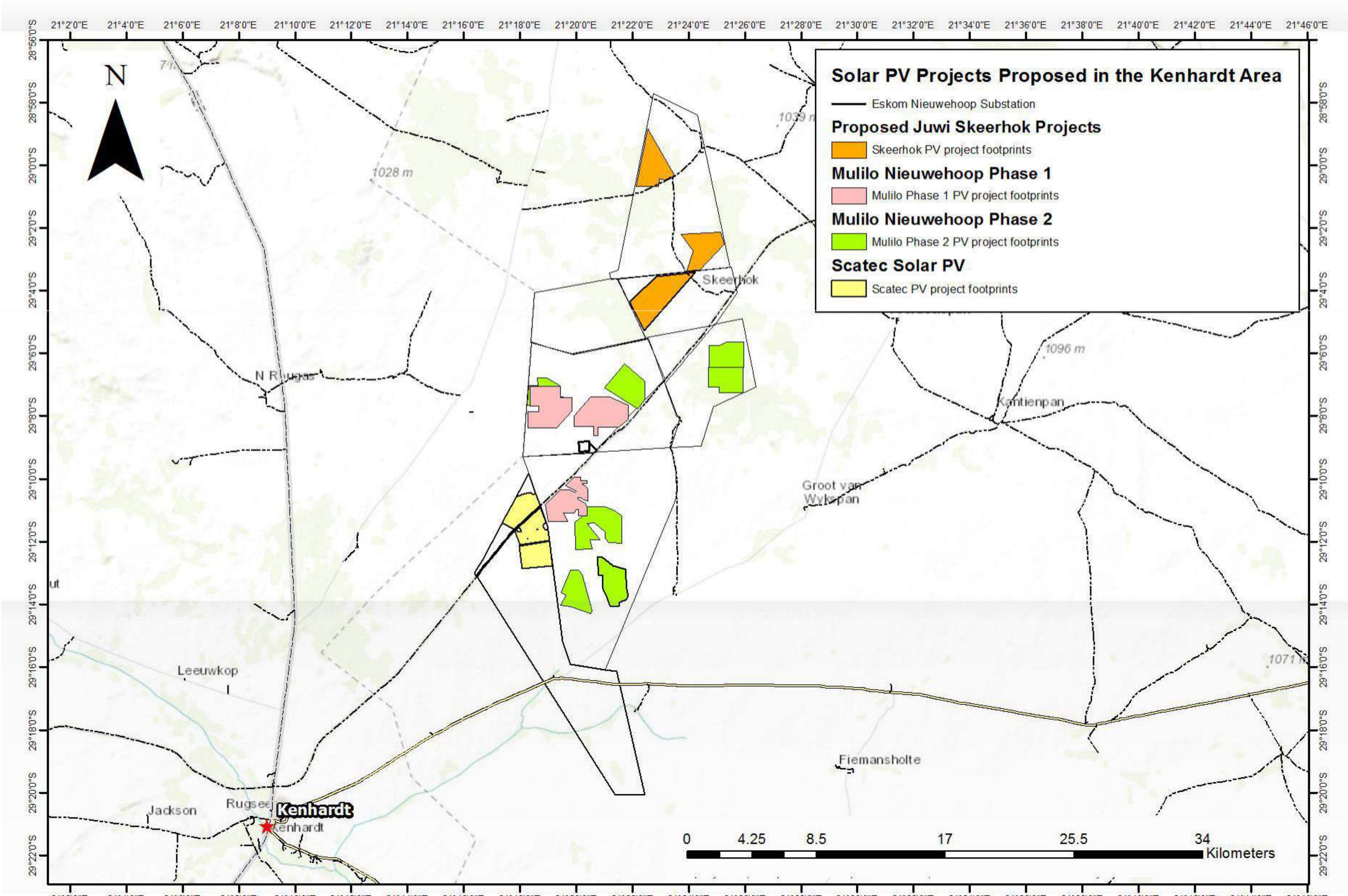

Figure 1: Cumulative locality map for the proposed three juwi Skeerhok Solar PV Projects, and the two reference studies (three Scatec Kenhardt Solar PVs and seven Mulilo Kenhardt Solar PVs) near Kenhardt in the Northern Cape.

2 APPROACH AND METHODOLOGY

2.1 Objectives

- Determine the current traffic conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Identify potential impacts and cumulative impacts that may occur during the construction, operational and decommissioning phases of development;
- Provide recommendations with regards to potential monitoring programmes;
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts; and
- Incorporate and address all issues and concerns raised by I&APs and the public (if applicable).

2.2 Methodology

The key steps followed in this statement are:

- Review of available desktop information, including the South African National Roads Agency (SANRAL) National traffic count information and google earth images;
- Review and assimilate information from similar projects (see sources below in Section 7).

The Final Scoping Report was submitted to the National DEA on 3 November 2017 for decision-making. The Scoping Report was accepted by the National DEA on 30 November 2017. As part of the acceptance, the National DEA had certain requirements for the TIS, as shown in Table 1.1 below.

Table 1.1: National DEA Requirements for the Traffic Impact Statement (Acceptance of Scoping letter – 30 November 2017)

DEA Requirement	Feedback from Specialist/sub-section where this is addressed
x. The specialist input referred to in comment (viii) of the comments on the draft scoping report signed 19 October 2017; must additionally address the following:	
▪ indicate whether the recommendation by the EAP that detailed studies are not required is acceptable;	Agreed, the TIS adequately investigates the traffic impacts of the development
▪ indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable;	Agreed.
▪ Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts	Appropriate mitigation measures are proposed for the development.

are eliminated;	
▪ Evaluate the appropriateness of the reference literature used;	Sufficient literature and baseline information has been utilised.
▪ Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input	No site inspection was carried out for the impact statement for this proposed project, however, the reference studies conducted by CSIR (2016) included site inspection(s). Please refer to Section 1.3 below for a description of the methodology used in the reference studies.
▪ Indicate if the studies being referred to covers the preferred site;	Although the reference studies used in compiling this TIS covered a different development footprint, the access roads and routes will be the same as they fall on the same farm (s). In addition, due to the fact that the Skeerhok projects will be using the same technology, similar traffic volumes can be expected.
▪ Provide an indication on the cumulative impacts of these studies in relation to the proposed development;	Refer to Section Table 1.2 below.
▪ Must be conducted or input provided by a suitably qualified specialist in the field	Refer to Appendix A for the full CV of the specialist.

3 AFFECTED ENVIRONMENT

During all phases (construction, operation and decommissioning) of the project, additional traffic will be generated. The highest traffic volumes will be created during the construction phase. This includes activities associated with:

- Site preparation and transporting the construction materials and associated infrastructure to the site; and
- Transportation of employees to and from the site on a daily basis.

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 a 6 m wide surfaced road with 1 lane per direction and unsurfaced shoulders. It has 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. It is currently proposed that existing roads will be used as far as possible, to avoid the construction of new roads for the proposed Skeerhok PV 1, PV 2 and PV 3 facilities.

Photographs (taken from the TIS – Source 1 below) are included (Photo 1.1-1.44) to show the intersection of the Transnet Service Road with the R27 and the condition of the roads.

Photo 1.1: R27 towards the south (taken towards Kenhardt). The board shows “Loop 14”, located to the left, which is accessed via the Transnet Service Road. (Image source: Google, 2010)

Photo 1.2: The intersection of the R27 and Transnet Service Road, going towards Kenhardt. As can be seen on this image, the R27 was being upgraded in 2010 (Image source: Google, 2010)

Photo 1.3: The intersection of the R27 and Transnet Service Road, going towards Keimoes (Image source: Google, 2010)

Photo 1.4: The access point to the Transnet Service Road (Image taken: July 2014)

Historic traffic volume figures are not available within the study area; however, the resultant traffic volumes has been assumed to be below the allowed maximum average daily traffic limit of 1000 veh/day. Although the proposed development is expected to generate trips during the construction, operation and decommissioning phases, the traffic generated will be low, based on similar studies conducted within the study area.

4 TRANSPORT INFORMATION

The general current limitations on road freight transport are:

- Axle load limitation of 7,7t on front axle, 9,0t on single rear axles;
- Axle unit limitations are 18t for dual axle unit and 24t for 3 axle unit;
- Gross vehicle mass of 56t. This means a typical payload of about 30t;
- Maximum vehicle length of 22m for interlink, 18,5m for horse and trailer and 13,5 for a single unit;
- Width limit of 2,6m; and
- Height limit 4,3m.

Abnormal permits are required for vehicles exceeding these limits.

4.1 Solar Farm Freight

Anticipated 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.

4.2 Traffic Generation

The traffic generation estimates have been based on similar studies conducted within the study area. The estimated traffic generated includes the Scatec Kenhardt project and the Skeerhok PV 1, 2 and 3 projects. The generated traffic for the Skeerhok PV 1, 2 and 3 projects are anticipated to be similar to the Scatec Kenhardt projects. The trip generation was calculated based on Client information and the Scatec project information.

- ***Construction Phase (per development Skeerhok 1/2/3)***

Approximately 800 x 40ft containers resulting in approximately 800 double axel trucks will come to site during the construction phase of 18 months. In addition to this, more or less 20 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 18 800 vehicle trips to and from the site.

It is assumed that construction will take place 5 days a week for a total of 235 standard working days per year, over a period of 18 months. A total of 353 construction days.

The maximum possible total trips per day will occur when containers are delivered to site during the 18-month construction period.

Containers:	+/- 1 truck every 2 days = 2 trips (In + Out)
Light trucks:	40 trips per day (In + Out)
Water trucks:	1 truck every 2 days = 2 trips (In + Out)
Total:	44 trips per day (In + out)

This is regarded as negligible traffic. Note that full Traffic Impact Assessments (TIA) are normally only required for developments that will generate more than 50 vehicle trips (In + Out) during any peak hour.

- ***Operational Phase (per development Skeerhok 1/2/3)***

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, the current estimate is that 2 trips per month will be made by a water truck.

The lifetime of the project is assumed as the maximum 20 years which means that the total amount of trips would be 61 440 over a 20-year operational life.

The maximum possible total trips per day to site during the operational phase will only occur if all scheduled vehicles arrive on the same day, as follows:

Single axle truck:	1 truck every week = 2 trips (In + out) Light trucks:
	8 trips per day (In + Out)
Water trucks:	1 trip every 2 weeks = 2 trips (In + Out)
Total:	10 trips per day (In + out)

This is regarded as negligible traffic.

- ***Decommissioning Phase (per development Skeerhok 1/2/3)***

As per the construction phase, approximately 800 x 40ft containers resulting in more or less 800 double axel trucks will come to site during the decommissioning phase. The decommissioning phase usually takes 12 months. In addition to this, more or less 20 light load trucks to and from site will come and go to site on a daily basis.

It is assumed that the decommissioning work will take place 5 days a week for a total of 235 standard working days per year, over a period of 12 months. A total of 235 days.

The maximum possible total trips per day will be as follows:

Containers:	7 trucks every 2 days = 14 trips (In + Out)
	= 7 trips per day (In + Out)
Light trucks:	40 trips per day (In + Out)
Total:	47 trips per day (In + out)

This is regarded as negligible traffic.

- ***Cumulative***

Although the 20km radius was considered for cumulative impact purposes, the worst case of all 6 approved developments proceeding simultaneously was used for the purpose of these calculations.. The cumulative impact assessment assumes that all the projects outlined within the cumulative impact section occur at the same time (Construction, operation and decommissioning phases). 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. The projects that have been approved to date within close proximity of each other are detailed within Table 1.2 below. Table 1.2 also includes the estimates for the three proposed Skeerhok PV projects. As noted above, the DEA has stated that no more than 6 projects will be approved in the area, as reflected in Table 1.2. 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.

Table 1.2: Cumulative daily traffic generation estimates for all PV projects proposed north-east of Kenhardt, including the Skeerhok projects (Scatec, 2016)

Project name		Daily traffic generation estimates		
		Construction Phase (veh/day)	Operational Phase (veh/day)	Decommission Phase (veh/day)
1	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 1) and proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 1)	21	5	21
2	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 2) and proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 2)	21	5	21
3	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 3) and proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 3)	21	5	21
4 to 6	Proposed Construction of Skeerhok 300 MW Solar facilities - PV 1 / 2 / 3	44 x 3 = 132	10 x 3 = 30	47 x 3 = 141
	Total	**195**	**45**	**204**

5 IDENTIFICATION OF IMPACTS

The traffic impacts that are likely to 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 amount of traffic will be generated by the proposed facility.

As per the table below, the impacts identified and assessed as part of the reference studies 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 all six projects in the area, including Skeerhok 1 to 3. The cumulative impact during the construction and decommissioning phases of all 6 projects cannot be assessed, as it is unlikely that all projects will be constructed or decommissioned over the same periods.

Table 1.3: Traffic Impact Assessment Table

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility	Irreplac-eability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confi-dence Level
										Without Mitigation	*With Mitigation*		
CONSTRUCTION AND DECOMMISSIONING PHASES													
Traffic gene-ration	Increase in traffic	Nega-tive	Regional	Short term	Moderate	Very likely	Yes	Replace-able	• A permit should be obtained from the PGNC Department of Public Works, Roads and Transport for any abnormal loads transported. • Provide a Transport Traffic Plan to SANRAL and the PGNC Department of Public Works, Roads and Transport. • Road and safety standards should be adhered to.	Low	Low	4	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Nega-tive	Local	Short term	Moderate	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 signage at access to site at R27 and Transnet Service Road intersection.	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	Moderate	Likely	Yes	Replace-able	• Implement management strategies for dust generation e.g. apply dust suppressant on 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 adhere to vehicle safety standards implemented by the Project Developer. • Avoid using old and noisy construction equipment and ensure equipment is well maintained.	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	Negative	Local	Short term	Slight	Likely	Yes	Replaceable	• 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 that will be used to addresses the following: - Grading requirements; - Dust suppressant requirements; - Drainage requirements; - Signage; and - Speed limits.	Low	Low	4	Medium
OPERATIONAL PHASE													
Traffic generation	Increase in traffic	Negative	Regional	Long term	Slight	Very likely	High	Replaceable	• Adhere to requirements made within Transport Traffic Plan; • Limit access to the site to personnel; • Increase traffic will be negligible.	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Negative	Local	Long term	Moderate	Likely	No	High irreplaceability	• 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. • Due to negligible traffic increases, increase in accidents is minimal.	High	Moderate	3	Medium
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Negative	Local	Medium term	Moderate	Likely	Yes	Replaceable	• 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	Dura-tion	Conse-quence	Proba-bility	Reversi-bility	Irreplac-eability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confi-dence Level
										Without Mitigation	***With Mitigation***		
	Change in quality of surface condition of the roads	Nega-tive	Local	Long term	Slight	Likely	Yes	Replace-able	• Implement requirements of the Road Maintenance Plan.	Low	Low	4	Medium
CUMULATIVE IMPACTS (Concurrent operational phase of all 6 developments)													
Traffic gene-ration	Increase in traffic	Nega-tive	Regional	Long term	Slight	Very likely	High	Replace-able	• Adhere to requirements made within Transport Traffic Plan; • Limit access to the site to personnel; Increase traffic will be negligible.	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Nega-tive	Local	Long term	Moderate	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. Due to negligible traffic increases, increase in accidents is minimal.	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	Mediu m term	Moderate	Likely	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

6 CONCLUSIONS AND RECOMMENDATIONS

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 the reference projects, the overall impact from traffic generation is anticipated to be low when implementing suitable mitigation measures. The highest traffic will be generated during the construction phase.

The measures included within the EMPr must be adhered to, with the main requirements outlined below:

- 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 and the PGNC Department of Public works, Roads and Transport.
- 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.

7 INFORMATION SOURCES

The information used for the compilation of this impact statement was drawn from the following sources:

1. Laurie, S. (2016). Traffic Impact Assessment for proposed Scatec Solar PV Energy Facilities near Kenhardt, Northern Cape Province. Surina Laurie, CSIR, Stellenbosch.
2. Laurie, S. (2014). Traffic Impact Assessment for the proposed Solar Energy Facilities of the Phase 1 Nieuwehoop Solar PV Park near Kenhardt. Surina Laurie, CSIR, Stellenbosch.
3. Laurie, S. (2015). Traffic Impact Assessment for the proposed Solar Energy Facilities of the Phase 2 Nieuwehoop Solar PV Park near Kenhardt. Surina Laurie, CSIR, Stellenbosch.
4. South African National Roads Agency (SANRAL) National traffic count information.
5. Satellite imagery of the site available on Google Earth was also used for evaluation.

8 DECLARATION OF INDEPENDENCE OF SPECIALIST

Mr Christo Bredenhann has reviewed this statement. Please refer to Appendix A of this Impact Statement for the Curriculum Vitae of Mr. Bredenhann and his letter (page 1), which confirms that this impact assessment is suitable for this project and in lines with his previous studies' findings. The declaration of independence by the specialist is provided below:

DECLARATION OF INDEPENDENCE

I, Christo Bredenhann, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Skeerhok PV 1, 2 and 3, and Skeerhok – Transmission Line Projects, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Digitally signed by Bredenhann, Christo
Date: 2018.02.07 10:27:09 +02'00'

CHRISTO BREDENHANN

Appendix A: Curriculum Vitae of the Specialist

CHRISTO BREDENHANN, Senior Traffic/ Transportation Engineer

Transport and Infrastructure

Years with the firm

5 years

Years total

16 years

Areas of practice

Traffic and Transportation engineering

Languages

English

Afrikaans

CAREER SUMMARY

Mr Bredenhann is a professional engineer with over 16 years' experience specialising in the traffic and transportation engineering sector. He has extensive experience in traffic and transportation impact assessments and statements for a multitude of land uses, formal review of traffic impact assessments, transportation planning, micro and macro network and capacity analysis, transportation planning and design, road safety audits, traffic signal timing design, road signs and markings audits, multi-modal transport assessments, non-motorised transport analysis and design and transport management plans.

Relevant expertise includes project management, proposals, tender documentation and bid adjudication, public transport planning and operational management, procedure development for the monitoring of integrated rapid transit operations and public transport scheduling development.

Countries of work experience include South Africa, Ethiopia, Uganda and the United Kingdom.

EDUCATION

BEng (Hons) Traffic and Transportation Engineering, University of Pretoria	2010
BEng Civil Engineering, University of Johannesburg (RAU)	1996

ADDITIONAL TRAINING

Certificate in Road Safety Audits, South African Road Federation	2015

PROFESSIONAL MEMBERSHIPS

Professional Engineer, Engineering Council South Africa (20150149)	2015
Associate Member, South African Institute of Civil Engineering (201300003)	2013

PROFESSIONAL EXPERIENCE

- Ethiopian Agri-processing Plants Traffic Impact Assessment, Ethiopia (Current): Lead Transportation Engineer – Traffic impact assessment. Client: United Nations Office for Project Services. Project Value: Unknown. Fee Value: ZAR 135,000.
- IRT Phase 2A Trunk and Feeder Support Infrastructure Work Package E5 Stage 2 Road Safety Audit, City of Cape Town, Western Cape, South Africa (Current): Lead Road Safety Auditor - Road safety audit. Client: GIBB Engineering & Science. Fee Value: ZAR 25,000.
- Erf 228 Raithby Residential Development Traffic Impact Assessment, Somerset West, Cape Town, South Africa (Current): Lead Transportation Engineer – Residential development traffic impact assessment. Client: Ginana cc. Fee Value: ZAR 89,000.
- Bloemdal Hospital Traffic Impact Assessment, Bloemfontein, Free State Province, South Africa (Current): Lead Transportation Engineer - Traffic impact assessment. Client: Bloemdal Hospital. Fee Value: ZAR 25,000.
- Farm Bergendal 1706 Mixed-use Development Traffic Impact Assessment, Bloemfontein, Free State Province, South Africa (Current): Lead Transportation

Engineer - Traffic impact assessment for mixed-use development. Client: WSP Bloemfontein. Project Value: Unknown. Fee Value: ZAR 48,000.

- Ya Rona Mixed-Use Development Traffic Impact Assessment, Bloemfontein, Free State Province, South Africa (Current): Lead Transportation Engineer – Traffic impact assessment. Client: MSC Consulting. Fee Value: ZAR 70,000.
- Tsogo Sun Flagship Central Business District Traffic Impact Assessment, Cape Town, Western Cape, South Africa (Current): Lead Transportation Engineer - Traffic impact assessment. Client: Tsogo Sun. Fee Value: ZAR 132,000.
- R300 Industrial Estate Traffic Impact Assessment, Cape Town, Western Cape, South Africa (Current): Lead Transportation Engineer - Traffic impact assessment for the industrial estate. Client: V2 Investments. Fee Value: ZAR 90,000.
- Integrated Rapid Transit Phase 2A Trunk and Feeder Support Infrastructure Work Package E1 Stage 2 Road Safety Audit, City of Cape Town, Western Cape, South Africa (Current): Lead Road Safety Auditor - Road safety audit. Client: GIBB Engineering & Science. Fee Value: ZAR 18,000.
- Integrated Rapid Transit Phase 2A Trunk and Feeder Support Infrastructure Work Package E3 Stage 2 Road Safety Audit, City of Cape Town, Western Cape, South Africa (Current): Lead Road Safety Auditor - Road safety audit. Client: GIBB Engineering & Science. Fee Value: ZAR 19,000.
- Kap Vley Wind Power Plant, Northern Cape, South Africa (Current): Lead Transportation Engineer - Traffic impact assessments to support environmental impact assessments. Client: Juwi Renewable Energies. Fee Value: ZAR 60,000.
- Penhill Residential Development, Cape Town, South Africa (Current): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layout, liaison with client and authorities. Undertake transport impact assessment for 192 ha residential development (approximately 10,000 units). Client: Western Cape Provincial Government Department of Human Settlements. Project Value: ZAR 33 m. Fee Value: ZAR 780,000.
- Athlone Power Station Redevelopment, Cape Town, South Africa (Current): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layouts. Liaison with client, stakeholders and authorities. Develop and draft traffic impact assessment, including revisions, and Council approval for 35 ha mixed-use redevelopment of Athlone Power Station site as Transit Oriented Development. Client: City of Cape Town. Project Value: ZAR 2 m. Fee Value: ZAR 100,000.
- Deep Freeze Macassar Upgrading Informal Settlement Programme, South Africa (Current): Project Member - Transport scoping report and traffic impact assessment for proposed redevelopment of settlement. Project in conjunction with lead consultant ARG Designs. Client: City of Cape Town. Fee Value: ZAR 380,000.
- McDonald's Traffic Impact Assessments, South Africa (Current): Project Member - Ongoing traffic impact assessments and transportation input to multiple sites' conceptual design. Client: McDonald's South Africa. Fee Value: ZAR 16,000 - ZAR 90,000 each.
- Port of Saldanha Bay Traffic Study, Saldanha Bay, Western Cape, South Africa (2017): Project Leader - Traffic study with specific focus on measures to improve efficiency and operation of all multi-purpose terminal traffic. Client: Transnet Port Terminals. Fee Value: ZAR 210,000.
- Bishop Lavis Urban Node Regeneration, Cape Town, Western Cape, South Africa (2017): Project Member - Transport scoping report and traffic impact

assessment for proposed upgrades of urban node and sports fields. Client: City of Cape Town. Fee Value: ZAR 275,000.

- Monwood Upgrading Informal Settlement Programme, South Africa (2017): Project Member - Transport scoping report and traffic impact assessment for proposed redevelopment of settlement. Project in conjunction with lead consultant ARG Designs. Client: City of Cape Town. Fee Value: ZAR 1.4 m.
- Preller Mega Centre Extension Road Safety Audit, Bloemfontein, Free State Province, South Africa (2016): Lead Road Safety Auditor. Client: Preller Mega. Project Value: Unknown. Fee Value: ZAR 30,000.
- Biotherm Solar and Wind Power Plants, Northern and Western Cape, South Africa (2016): Lead Transportation Engineer - Traffic impact assessments to support environmental impact assessments. Client: Biotherm. Project Value: ZAR 100,000. Fee Value: ZAR 45,000.
- R27 Section 9 Road Safety Audit, Northern Cape, South Africa (2016): Lead Road Safety Auditor - Stage 3 road safety audit. Client: South African National Roads Agency. Project Value: ZAR 100,000. Fee Value: ZAR 100,000.
- N8 Section 13 Compulsory Truck Stop, Free State Province, South Africa (2016): Lead Road Safety Auditor - Stage 3 road safety audit. Client: South African National Roads Agency. Project Value: ZAR 7.9 m. Fee Value: ZAR 50,000.
- Conradie Better Living Model Exemplar Project, Cape Town, South Africa (2016): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layouts. Liaison with client, stakeholders and authorities. Develop and draft traffic impact assessment, including revisions, and Council approval for 22 ha high-density residential and mixed-use Transit Oriented Development. Client: Provincial Government of Western Cape. Project Value: ZAR 2.5 m. Fee Value: ZAR 2.5 m.
- N7 Section 4 Road Safety Audit, Western Cape, South Africa (2016): Lead Road Safety Auditor - Stage 3 road safety audit. Client: South African National Roads Agency. Fee Value: ZAR 100,000.
- Public Transport Shelter and Stop Survey and Design, South Africa (2016): Project Member - Survey planning, implementation programming and contract administration. Client: City of Cape Town. Fee Value: ZAR 5.1 m.
- Botleng, Delmas Shopping Centre, South Africa (2015): Project Member - Traffic impact assessment for proposed development. Client: Nonya Properties. Fee Value: ZAR 45,000.
- Breswal Alt Benoni Shopping Centre, South Africa (2015): Project Member - Traffic impact assessment for proposed development. Client: Nonya Properties. Fee Value: ZAR 40,000.
- Northmead Mall Extensions Traffic Impact Assessment, Ekurhuleni, Gauteng, South Africa (2015): Project Member - Traffic impact assessment for proposed extensions. Client: Bentel Properties. Fee Value: ZAR 50,000.
- Auckland Park Traffic Calming Study, South Africa (2015): Project Member - Traffic calming study for residential suburb. Client: Johannesburg Development Agency. Fee Value: ZAR 24,000.
- Gwigwi Mrwebi Street Johannesburg "Complete Streets" Traffic Study, South Africa (2015): Project Member - Traffic calming study for residential suburb. Client: Atterbury Properties. Fee Value: ZAR 32,000.
- Beach View Hout Bay Traffic Impact Assessment, South Africa (2014): Project Member - Transport scoping report for proposed development. Client: Private. Fee Value: ZAR 65,000.

- AgriProtein Cape Town, Traffic Impact Assessment, South Africa (2014): Project Member - Traffic impact assessment for new development. Client: WSP Environmental. Fee Value: ZAR 40,000.
- Port of Saldanha Bay Traffic Study, South Africa (2014): Project Leader - Traffic study with specific focus on measures to improve Port traffic management and operations, preferred mitigation measures, revised traffic management plan, public transport/ shuttle services, access upgrades, vehicle washing facilities (pollution control), road (link) and intersection upgrades. Client: Transnet Port Terminals. Fee Value: ZAR 286,000.
- Saldanha Bay Local Area Plan, South Africa (2014): Project Member - Transport scoping report and transportation planning. Project in conjunction with lead consultant ARG Designs. Client: Department of Rural Development and Land Reform. Fee Value: ZAR 65,000.
- Signal Hill People Mover, South Africa (2014): Project Leader - Technical feasibility and risk assessments of proposed mechanical people mover between Strand Street quarry and Signal Hill summit. Client: SANParks. Fee Value: ZAR 1 m.
- Nando's Restaurants, South Africa (2014): Project Member - Traffic impact assessments and transportation input to conceptual design of multiple sites. Client: Nando's South Africa. Fee Value: ZAR 50,000.
- Central Johannesburg College Traffic Impact Assessment, South Africa (2014): Project Member - Traffic impact assessments with specific focus on non-motorised transport environment. Client: Stauch Vorster Architects. Fee Value: ZAR 1 m.
- Landdroskop Road upgrade, South Africa (2014): Project Member - Tender document preparation and adjudication, resident engineer, inspection, payment certificates and closeout report. Client: CapeNature. Fee Value: ZAR 1,4 m.
- NATREF CF2 Traffic Impact Assessment, South Africa (2013): Project Member - Traffic impact assessment for implementation of refinery upgrades. Client: Nemai Consulting. Fee Value: ZAR 90,000.
- Carletonville Police Station Traffic Impact Assessment, South Africa (2013): Project Member - Traffic impact assessment for new station. Client: Maluleke Luthuli Development Planners. Fee Value: ZAR 55,000.
- First in Spec Biofuels, Traffic Impact Assessment, Coega, South Africa (2013): Project Member - Traffic impact assessment for new development. Client: First in Spec Biofuels. Fee Value: ZAR 50,000.
- National Port Masterplan, South Africa (2014): Project Member - Transport assessment and road and rail masterplanning. Responsible for Port Nolloth, Port of Saldanha Bay, Port of Cape Town and Port of Mossel Bay. Client: Transnet Ports Authority. Fee Value: ZAR 1.8 m.
- Mfuleni Urban Node Regeneration, South Africa (2014): Project Leader - Transport scoping report and traffic impact assessment for proposed regeneration of urban node. Project in conjunction with lead consultant ARG Designs. Client: City of Cape Town. Fee Value: ZAR 300,000.
- Tableview Beachfront Traffic Study, South Africa (2013): Project Member - Transport study and assessment including proposals for rationalisation of road network. Client: City of Cape Town. Fee Value: ZAR 180,000.
- Paarden Eiland Milnerton South Local Area Spatial Development Framework, South Africa (2013): Project Leader - Transport scoping report and input to design framework for Local Area Spatial Development Framework. Project

undertaken in conjunction with lead consultant ARG Designs. Client: City of Cape Town. Fee Value: ZAR 350,000.

- SAPREF CF2 Traffic Impact Assessment, South Africa (2013): Project Member - Traffic impact assessment for implementation of refinery upgrades. Client: Shell and BP South Africa Petroleum Refineries. Fee Value: ZAR 75,000.
- Polokwane South Shopping Centre Traffic Impact Assessment, South Africa (2012): Project Member - Traffic impact assessment. Client: Moolman Group Properties. Fee Value: ZAR 80,000.
- Kwa-Guqa Shopping Centre, Emalahleni Traffic Impact Assessment, South Africa (2012): Project Member - Traffic impact assessment. Client: Moolman Group Properties. Fee Value: ZAR 80,000.
- Transport Planning and Traffic Study Pearl Marina, Uganda (2013): Project Leader - High-level transport masterplan and traffic impact assessment for proposed 400,000 m² GLA mixed-use luxury residential and commercial development (12 km east of Entebbe, Uganda on undeveloped peninsula site with a shoreline on Lake Victoria). Client: Centum Investment Company Limited, Kenya. Fee Value: ZAR 40,000.
- Wits Gold DRM Transport Management Plan, South Africa (2013): Project Leader - Detailed transport management plan as part requirement of environmental impact assessment process for proposed new gold mine. Client: GCS Water and Environmental Consultants. Fee Value: ZAR 80,000.
- Integrated Rapid Transit (MyCITI) Milestone Zero, Operational Support, South Africa (2012): Project Leader - Operational support contractual monitoring, reporting of transgressions and potential penalties, development of procedures, rollout of electronic control and ticketing system. Client: City of Cape Town. Fee Value: ZAR 12 m.
- Closeout Reports for Reconstruction and Development Programme Housing Projects, Eastern Cape, South Africa (2011): Project Member - 26 detailed closeout reports of completed and ongoing housing projects undertaken on behalf of Department for districts and local municipalities. Client: Department of Human Settlements: Eastern Cape Province. Fee Value: ZAR 600,000.
- Johannesburg Inner City Pedestrian Malls Project, Johannesburg, South Africa (2010): Project Leader - Traffic impact assessment to determine feasibility of converting four road sections in Johannesburg's inner city to full or partial pedestrian malls. Study included SATURN modelling conducted by sub-consultant, GOBA. Client: Johannesburg Development Agency. Fee Value: ZAR150,000.
- Rural Transport Business Plan Development, North West Province, South Africa (2010): Project Member - Evaluation of identified transport projects in various regions, and formulation of business plans to assist implementation. Client: National Department of Transport. Fee Value: ZAR 200,000.
- Eveleigh Extension 22, Boksburg, South Africa (2012): Project Leader - Traffic impact assessment to address various traffic-related objections raised in rezoning application. Client: Bentel Property Group. Fee Value: ZAR 70,000.
- Johannesburg Inner City Traffic and Transportation Study, Johannesburg, South Africa (2010): Project Coordinator - Multi-modal transport assessment and travel demand management measures. Client: Johannesburg Development Agency. Fee Value: ZAR 600,000.
- Traffic Engineering Support for City Council of Ekurhuleni, South Africa (2009): Project Leader - Land use applications, traffic safety investigations, traffic impact studies, security access restrictions, directional and tourism signage. Client: Ekurhuleni Metropolitan Municipality. Fee Value: ZAR 1.4 m.

- Gautrain, South Africa (2010): Project Member - Traffic monitoring, site visits, secretary of Gautrain coordination committee of Ekurhuleni Metropolitan Municipality. Undertook revised traffic impact assessment of Rhodesfield and Metrorail Station. Client: Gauteng Department of Public Transport Roads and Works. Fee Value: ZAR 500,000.
- Traffic Engineering Support for City Council of Tshwane, South Africa (2009): Project Leader - Assessment of traffic impact studies with emphasis on public transport and land-use aspects Client: City of Tshwane. Fee Value: ZAR 1.2 m.
- 2010 FIFA World Cup, Johannesburg and Pretoria, South Africa (2009): Project Member - Parking, freight planning, fan parks, pedestrian accommodation, traffic impact studies, traffic safety and transportation planning. Client: City of Tshwane. Fee Value: ZAR 300,000.
- Project Management of Johannesburg Roads Agency Capital Expenditure, Johannesburg, South Africa (2007): Senior Engineer - Identification of projects, budget allocation and oversight of capital spending. Tender documentation, bid adjudication and final inspection at completion. Directional Signage and Tourism Signage. Applications were received, assessed on site where necessary, and processed. Client: Johannesburg Roads Agency. Project Value: Undisclosed.
- Management of JRA traffic safety, South Africa (2007): Project Leader - Traffic safety investigations and training of technicians. Liaison and site meetings with councillors, clients and applicants where applicable. Client: Johannesburg Roads Agency. Project Value: Undisclosed.
- Gautrain Passenger Rail, South Africa (2007): Senior Engineer - Traffic related aspects of Gautrain project. Client: Johannesburg Roads Agency. Project Value: Undisclosed.
- Network planning, Johannesburg, South Africa (2006): Engineer - Macro and micro network analysis of existing and proposed road network in vicinity of project. Trip generation, trip distribution, trip allocation of proposed project. Generating GIS maps consisting of aerial photographs and existing and future road networks. Client: Waterfall City Development and Riverglen Estate Development. Fee Value: ZAR 200,000.
- Carletonville Bypass, Carletonville, South Africa (2006): Engineer - Network study and planning of bypass route to Carletonville. Feasibility study, generating GIS maps, recommendations and final report. Client: Gauteng Department of Roads and Transport Fee Value: ZAR 50,000.
- Cradle of Humankind, North West Province, South Africa (2005): Engineer - Network study and route planning through Cradle of Humankind. Addendums to existing route determinations and/ or basic planning of affected routes. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 30,000.
- Strategic Major Road Network, Johannesburg, South Africa (2005): Engineer - Network study and route planning affected by possible re-alignment of K77. Determining possible extensions of route into Johannesburg CBD to ensure network continuity. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 26,000.
- Road Safety Audits, Eastern Cape Province, South Africa (2005): Engineer - Road safety audits of three provincial routes in Eastern Cape including fieldwork, road safety audits and assessments, remedial measures' reports including schedules of quantity, report writing and generating GIS maps of roads, highlighting all safety deficiency locations. Client: Province of Eastern Cape, Department of Transport. Fee Value: ZAR 65,000.
- Security Access Restrictions in Greater Johannesburg, South Africa (2005): Engineer - Traffic impact studies for various suburban areas in Greater

Johannesburg who wish to apply for Security Access Restrictions (SARS) in terms of Johannesburg Road Agency SARS policy. Assessment of Security Access Restrictions Applications. Client: Various. Fee Value: ZAR 300,000.

- Pennyville Extension 1, Johannesburg, South Africa (2005): Engineer - Traffic impact studies for new township in Soweto, specific emphasis on pedestrian movement, safety, and future inter-modal facility adjacent to site as part of Johannesburg Metro's SPTN network. Client: Bigen Africa/ Pennyville Zamamphilo Relocation. Fee Value: ZAR 110,000.
- Union Buildings, Pretoria, South Africa (2005): Engineer - Studies for upgrades to Union Buildings. Specific emphasis on pedestrian accommodation, parking requirements and VIP visitors during special events. Client: Office of the President. Fee Value: ZAR 20,000.
- New Road/ N1 Freeway Single Point access Interchange, Johannesburg, South Africa (2005): Engineer - Traffic impact study undertaken to determine level of service, deficiencies and general operation of New Road/ N1 Freeway Single Point access interchange. Client; Gauteng Department of Roads and Transport. Fee Value: ZAR 50,000.
- BP Freeway Service Area at Beyers Naude/ N1 Freeway Access Interchange, Johannesburg, South Africa (2005): Engineer - Traffic impact study to determine transgressions, operation, accident hotspots, feasibility and deficiencies of BP Freeway Service Area at Beyers Naude/ N1 freeway access interchange. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 50,000.
- Residential Development and Killarney Mall Extension on Riviera Road and Oxford Road, Johannesburg, South Africa (2004): Engineer - Traffic impact study, SIDRA analysis of intersections, recommendations for required upgrades and temporary measures required during construction phase. Client: David Lieberman Architects. Fee Value: ZAR 77,000.
- Randburg - Sandton Link, Johannesburg, South Africa (2004): Engineer - Investigation of east-west linkage between areas. Evaluation of previous traffic impact study and confirmation of current status. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 24,000.
- Left-in Left-out Access Study, Gauteng, South Africa (2004): Engineer - Report on investigation of left-in/ left-out only accesses on arterial routes, CORSIM modelling of possibilities and recommendations of most suitable options. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 25,000.
- Mafikeng Airport Feasibility Study, Mafikeng, South Africa (2004): Engineer - Feasibility study to determine airport's economic survivability. Analysis of historical landing data and revenue streams. Client: Price Waterhouse Coopers. Fee Value: ZAR 35,000.
- Roundabouts Design Guide, Gauteng, South Africa (2004): Engineer - Investigation and design guide for roundabouts on provincial roads, including ARNDT modelling of approach speeds, volumes and geometry. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 64,000.
- N1 Toll Study, Pretoria, South Africa (2004): Engineer - Investigation of queue lengths, level of service and operation of Carousel and Pumulani Plazas, analysis of historical data, queuing analysis and recommendations to improve operation. Client: Bakwena. Fee Value: ZAR 48,000.
- Building Lines Policy, Gauteng, South Africa (2003): Engineer - Generation of final Gauteng Department of Roads and Transport policy document regarding building lines adjacent to provincial roads. Client: Gauteng Department of Roads and Transport. Fee Value: ZAR 80,000.

- London Transport Underground Optimisation, United Kingdom (1998): Project Member - Transport traffic surveys and optimisation project for London underground system. Client: London Transport. Fee Value: ZAR 550,000.

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX N3:

Social Impact Statement

Statement prepared by:

CSIR – Environmental Management Services
P O Box 320
Stellenbosch
South Africa

Statement reviewed by:

Applied Science Associates (Pty) Ltd-
Rudolph du Toit
3 Red Oak Lane, Welgevonden
Stellenbosch
South Africa

December 2017

APPLIED SCIENCE ASSOCIATES

26 January 2018

Mrs. Kelly Stroebel
CSIR Environmental Management Services
11 Jan Cillier Road
Stellenbosch
7600

RE: EXTERNAL REVIEW OF THE SOCIAL IMPACT STATEMENT PREPARED FOR THE PROPOSED SKEERHOK 1 SOLAR PHOTOVOLTAIC (PV) FACILITY ON FARM SKEERHOK 395, PORTION 0, KENHARTD, NORTHERN CAPE PROVINCE

This letter is submitted in response to a Department of Environmental Affairs (DEA) request for an external review of the Social Impact Statement (SIS) submitted by CSIR as part of the EIA application for the Skeerhok 1 Solar PV facility. Juwi Renewable Energies (Pty) Ltd (the Applicant) subsequently appointed Applied Science Associates (Pty) Ltd on 18 January 2018 to conduct the requisite external review.

1. Context of the review

The Kenhardt area has seen a significant increase in solar PV EIA applications over the past 3 years (at least 11 applications have been submitted to DEA). All the relevant applications are proposed on a small cluster of farms located to the north-east of Kenhardt. As a result, numerous EIA reports, with attendant Social Impact Assessments (SIA) have been completed for this comparatively small geographic area. The anticipated social impacts likely to occur as a result of the proposed Skeerhok 1 Solar PV application is therefore well understood and extensively documented. In light of this reality, DEA instructed Juwi Renewable Energies (Pty) Ltd to compile a SIS, which draws on the findings of existing SIAs rather than primary research, in order to identify social impacts and assess its relative significance.

Consequently, the review findings presented in this letter is provided within the context of the detail, content, and level of research which is commensurate with an impact statement; and not a full-scale impact assessment.

2. Structure of the review

DEA requested that the review should answer the following questions:

- Indicate whether the recommendation by the Environmental Assessment Practitioner (EAP), that detailed studies are not required, is acceptable;
- Indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable;
- Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated; and
- Evaluate the appropriateness of the reference literature used.

DEA further resolved that the external review findings should be submitted in the form of a cover letter; and not a full review report as is customary for the review of SIAs.

3. Review findings

3.1 *Indicate whether the recommendation by the Environmental Assessment Practitioner (EAP), that detailed studies are not required, is acceptable*

The recommendation is acceptable. Social change processes are, in general, slow changing variables which are unlikely to have changed significantly over the past 3 years since the original SIAs were drafted. Slow rates of social change are also associated with communities which are relatively insulted from exogenous change and shocks. While the Kenhardt community is most certainly vulnerable to change and shock; it is, by virtue of its rural location and limited economic growth, relatively insulated from exogenous socio-economic change processes (This notably excludes climate-related shocks). Furthermore, none of the proposed solar PV facilities, which are the topic of the SIAs considered in the impact statement, have received preferred bidder status; nor have any of these facilities been constructed in the study area. As a result, the economic and labor force context of the study areas is unlikely to have changed significantly since 2015.

3.2 *Indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable*

The methodology used is acceptable. The SIS is correct in concluding that the argument in support of an impact statement is based on: (*i*) the abundance of social impact research available for the study area; (*ii*) the relative recency of said social impact research; and (*iii*) the similarity of the proposed development to previously assessed facilities. These factors are self-explanatory and, if considered together, provides a clear rationale that detailed studies are not required.

However, the research methodologies employed in the original SIAs, though referenced, is not explained in the SIS. This exclusion places a reader who is unfamiliar with said methodologies at disadvantage; as the research findings presented in the SIS could be difficult to interpret in the absence of a methodological framework.

The SIS should be updated to include a brief summary of the research methodologies upon which the findings in the report is based; alternatively, all references to these methodologies should be removed from the SIS.

3.3 Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated

The proposed mitigation measures and recommendations are suitable within the context of the proposed Skeerhok 1 Solar PV facility.

3.4 Evaluate the appropriateness of the reference literature used

The reference material used is appropriate. However, the 2014 Integrated Development Plan (IDP), and the Statistics South Africa 2011 Census Report used in the SIS appears to be dated. The !Kheis Local Municipality recently released its 2017/2018 IDP document, while Statistics South Africa has released the 2016 Community Household Survey. All the figures and facts extracted from the 2014 IDP, and the 2011 Census Report should be reviewed by CSIR to ensure accuracy. In addition, CSIR should update the SIS reference list to include the latest version of the IDP and the Statistics South Arica 2016 Community Household Survey.

It should be noted that, although updating of the reference literature is required, the basic socio-economic data presented in the SIS is unlikely to have changed significantly (please refer to the explanation of slow social change processes provided under *3.1* above). However, should the new material introduce significantly different socio-economic data; such data must be stated in the SIS, the relevant impacts and mitigation measures should be amended accordingly, and the SIS should be resubmitted to for external review.

4. Review statement

The SIS prepared for the proposed Skeerhok 1 Solar PV facility appears to be accurate in terms of the identified social impacts, the relative significance of said impacts, and the mitigation measures proposed. The SIS will benefit from a summary of the research methodologies employed in the SIAs which form the basis of the impact statement's findings; or alternatively removing all references to said methodologies so as to avoid confusion. In addition, the reference documents used in the SIS must be updated to include the !Kheis Local Municipality 2017/2018 IDP, and the 2016 Statistics South Africa Community Household

Survey. Should the updated material introduce significantly different socio-economic data; the SIS should be updated accordingly and resubmitted for external review.

However, these limited deficiencies, though in need of correction, do not appear to vitiate the basic accuracy of the impact statement.

In light of the above, this external review concludes that should the proposed changes be applied, and should no significantly new data be forthcoming from the updated reference material; the findings, accuracy, content, and quality of the Skeerhok 1 Solar PV SIS is of an acceptable standard, and is fit for purpose.

Yours sincerely,

Rudolph du Toit

Managing Director
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CONTENTS

Tables

Figures

SOCIAL IMPACT STATEMENT

1 INTRODUCTION

juwi Renewable Energies (PTY) Ltd is proposing to develop three 100 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (a 132 kV transmission line for each 100 MW facility) on Portion 0 of Smutshoek Farm 395 and Portion 9 of Gemsbok Bult 120, and the connection points to the Eskom Nieuwehoop Substation on the Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province.

As per the Plan of Study included in Final Scoping Report (September 2017) and subsequently approved by the Department of Environmental Affairs (DEA) on 30 November 2017, it was indicated that a **Social Impact Statement** will be produced to identify potential social impacts of the proposed development for the proposed Skeerhok PV 1, Skeerhok PV 2, and Skeerhok PV 3 solar energy projects, as well as the proposed Skeerhok PV – Transmission Line Basic Assessment project near Kenhardt in the Northern Cape. Various projects have been approved within the same area as the proposed Skeerhok PV facilities (Figure 1) and all the previous Environmental Impact Assessments (EIAs) included Social Impact Assessments (SIAs). There is therefore a large amount of information regarding the social impacts associated with PV projects in the Kenhardt area and these impacts are well known and documented. For this reason, it was proposed that a full specialist impact assessment is not deemed necessary for these projects.

This impact statement has been compiled by the CSIR using existing information and reviewed by Mr. Rudolph du Toit of Applied Science Associates (Pty) Ltd. The studies used as a reference for this impact statement are listed in Section 7.

1.1 Terms of Reference

The Social Impact Statement includes:

- A review of existing information, and collecting and reviewing baseline social information etc.
- Data from conducted interviews with key affected parties, including local communities, local landowners, key government officials (local and regional) etc as part of the reference studies (undertaken as part of the previous SIAs).
- An identification and assessment of key social issues and potential impacts (negative and positive) associated with the construction, operational and decommissioning phases of the proposed projects.
- An identification of potential mitigation and enhancement measures.
- A statement which includes an assessment of the potential social impacts associated with the proposed projects.
- An outline of mitigatory measures and additional management or monitoring guidelines.
- Input for the Environmental Management Programme (EMPr), including mitigation and monitoring requirements to ensure that negative social impacts are limited.

The Final Scoping Report was submitted to the National DEA on 3 November 2017 for decision-making. The Scoping Report was accepted by the National DEA on 30 November 2017. As part of the acceptance, the National DEA had the certain requirements for the Social Impact Statement, as shown in Table 1 below.

Table 1: National DEA Requirements for the Social Impact Statement (Acceptance of Scoping letter – 30 November 2017)

DEA Requirement	Feedback from Specialist/sub-section where this is addressed
x. The specialist input referred to in comment (viii) of the comments on the draft scoping report signed 19 October 2017; must additionally address the following:	
• indicate whether the recommendation by the EAP that detailed studies are not required is acceptable;	Please refer to cover letter above.
• indicate whether the methodology used to arrive at the conclusion that detailed studies are not required is clearly explained and acceptable;	Please refer to cover letter above.
• Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated;	Please refer to cover letter above.
• Evaluate the appropriateness of the reference literature used;	Please refer to cover letter above.
• Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input	No site inspection was carried out for the impact statement for this proposed project, however, the reference studies conducted by CSIR (2016) included site inspection(s). Please refer to Section 1.3 below for a description of the methodology used in the reference studies.
• Indicate if the studies being referred to covers the preferred site; and	Although the reference studies used in compiling this TIS covered a different development footprint, the access roads and routes will be the same as they fall on the same farm (s). In addition, due to the fact that the Skeerhok projects will be using the same technology, similar loads and frequencies can be expected.
• Provide an indication on the cumulative impacts of these studies in relation to the proposed development.	Refer to Section Table 1.2 below.
• Must be conducted or input provided on by a suitably qualified specialist in the field	Refer to Appendix A for the full CV of the specialist.

1.2 Study approach and methodology

The SIAs used as reference for this statement consulted secondary data sources (published documentation) to obtain basic socio-economic baseline demographics. This secondary data was then augmented with primary data generated by a site visit to the proposed project site as well as the town of Kenhardt. The methodologies used in the reference studies included:

- *Applied Anthropological Methods*
    - Collection of primary data during the site visit was guided by a Participant Observation Methodology (Anderson & Taylor, 2002).
    - The interviews aimed to uncover the major livelihood strategies present in the study area, to understand the key socio-economic challenges, and gain insights into the 'constructed reality' of the Kenhardt community.
    - Observation of community members' lives, routines and living environments help to gain insight into practices, patterns and processes which community members may not be consciously aware of.

- *Systems Theory*
    - A holistic approach was adopted towards understanding and representing the affected environment.
    - Accordingly, the receiving environment and subsequent impacts thereon were viewed and interpreted as a coupled socio-ecological system (SES).
    - Typical socio-economic baseline data is then represented in a Causal Loop Diagram (CLD) to illustrate the systemic causal linkages between variables present in the SES in which the study area is located.

- *Vulnerability Context*
    - An Asset Pentagon was used to interpret the collected information. An Asset Pentagon is an assessment method developed within the discipline of Livelihoods Assessment, and aims to establish the vulnerability context of a given social grouping.
    - As a result, the research approach is descriptive in nature and uses indicative reasoning to reach its impact assessment findings.

1.3 Assumptions and Limitations

The following assumptions and limitations were listed in the SIAs and would therefore apply to this impact statement:

- Primary and secondary data on the study area is very limited. The site visit undertaken as part of the reference studies (CSIR, 2015) was therefore intended to gather sufficient primary data to guide the SIA. However, information gathered during the site visit generally carried a medium level of confidence as the SIA is an applied research method, as opposed to a scientific research method. This means that much less time and resources are available for primary research and the subsequent verification of findings. As a result, the majority of the significance ratings ascribed to both the potential positive and negative impacts of the proposed Kenhardt PV and Transmission Line projects were given a ***medium*** confidence rating.
- The SIAs assumed that the majority of socio-economic impacts will be experienced in the town of Kenhardt; due to its proximity to the project site. It is however possible for socio-economic

impacts to be experienced in other urban nodes close to the project site. The project boundary, in terms of socio-economics, is therefore arbitrarily constructed.

- The cumulative impact assessment assumes that a total of **six** approved renewable energy developments will be awarded preferred bidder status in the surrounding area, as stipulated by the DEA within the Scatec Environmental Authorisation letter for 14/12/16/3/3/2/837, "Conditions of this Environmental Authorization", Scope of Authorisation, Point 2 (07/08/2017). However, as a precautionary approach, all developments were included in the cumulative impact assessment.

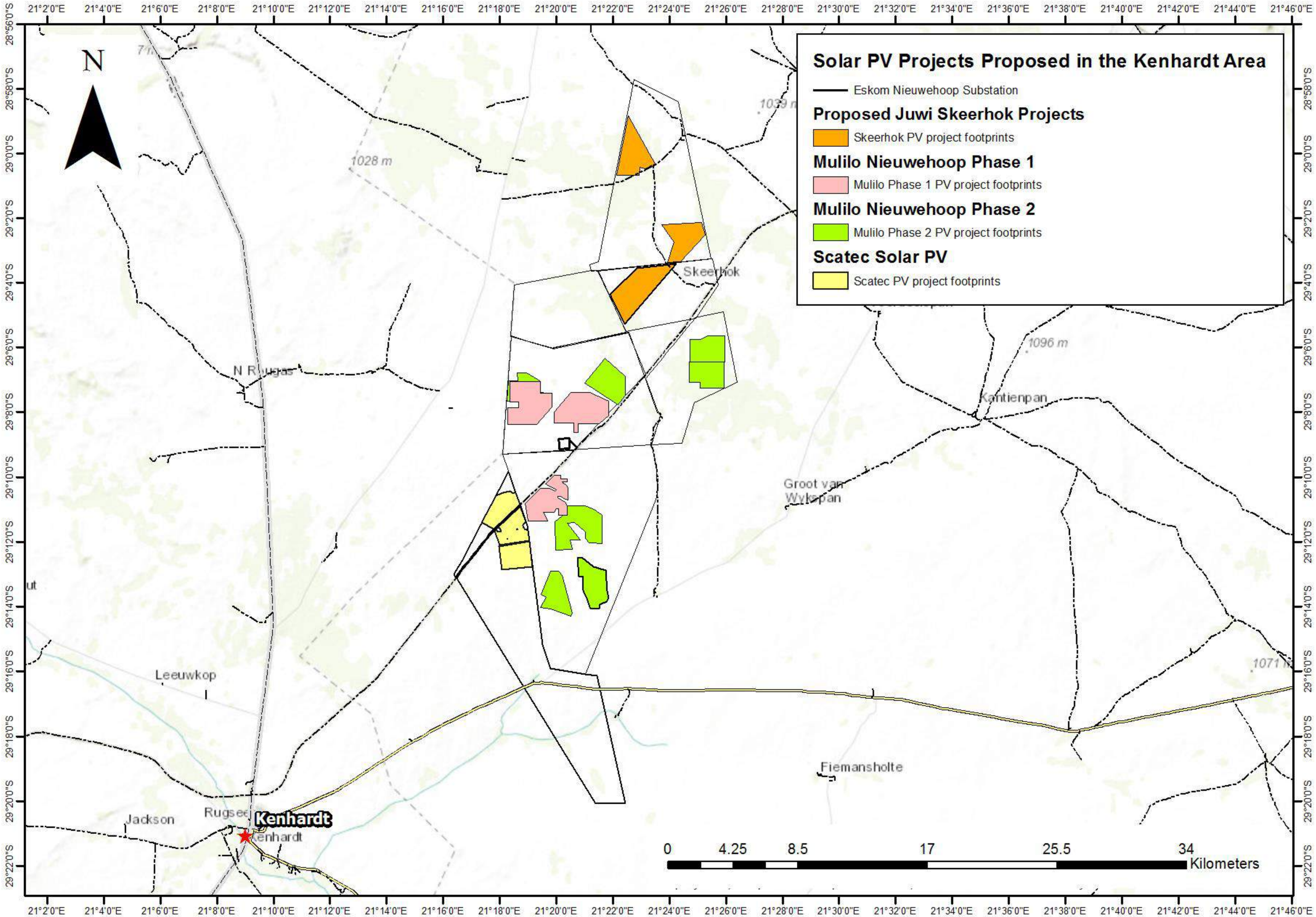

Figure 1: Cumulative locality map for the proposed three juwi Skeerhok Solar PV Projects, and the two reference studies (three Scatec Kenhardt Solar PVs and seven Mulilo Kenhardt Solar PVs) near Kenhardt in the Northern Cape

2 PROJECT CONTEXT (SOCIO-ECONOMICS)

2.1 Project Information

The current land use of the proposed project areas, as well as the surrounding land parcels is zoned for agricultural development and use (see locality in Figure 1 above). The construction phase of each proposed solar PV facility would last approximately 18 months. The construction phase of the proposed transmission line (which is subject to the BA Process) is expected to last 12 to 14 months. However, it should be noted that the construction period is subject to the final requirements of Eskom and the Renewable Energy Independent Power Producer Procurement Request for Proposal provisions at that point in time.

Employment opportunities created during the construction phase for the PV projects equates to 1600 (600 direct and 1000 indirect) employment during the construction period and 200 (50 direct and 150 indirect) employment opportunities during the operation period. Employment opportunities created during the construction phase of each transmission line project are estimated to range between 1 560 and 1 820 man months. It should be noted that the employment opportunities provided in this Statement are estimates taken from the reference studies and is dependent on the final engineering design and the REIPPPP Request for Proposal provisions at that point in time.

Employment opportunities to be created during the operational phase equate to approximately 4 800 man months (for skilled opportunities) and approximately 9 600 man months (for unskilled opportunities) per project (i.e. three 100 MW PV projects in total) over the 10 -20 year plant lifespan. A detailed project description is provided in Chapter 2 of the EIA Report and Section A of the BA Report.

3 AFFECTED SOCIO-ECONOMIC ENVIRONMENT

3.1 Socio-economic Baseline Data

3.1.1 Secondary Data

The study area is located within the ZF Mgcawu District Municipality (formally known as the Siyanda District Municipality) and the the !Kheis Local Municipality. However, the closest urban centre, Kenhardt, is located in the Kai !Garib Local Municipality. Given the proximity of the proposed projects to the town of Kenhardt; the focus of this Social Impact Statement will be on the Kai !Garib Local Municipality (Figure 1.2), as this is where the vast majority of potential project impacts (both positive and negative) might manifest.

According to the Kai !Garib Final IDP (2017/18) and the Stats SA 2011 Census data, the total population of the Kai !Garib municipal area is 68 929; of which 6 679 resides in the Kenhardt area. A total of 16 703 households resides in the Kai !Garib Local Municipality, with 35% of households being female headed. The total female population dominates the total male population by 8.5% (Kai !Garib Draft IDP, 2017/18). 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. Accordingly, the dependency ratio (the economically active population vs the non-economically active population) is 41.9% (Stats SA, 2011). The official unemployment rate of 10% has decreased by 6.1% since the 2011 Census measurement of 16.1%. The economic sector is dominated by agriculture which provides 51.8% of jobs, followed by the Community and Government Services sector with 15.9%.

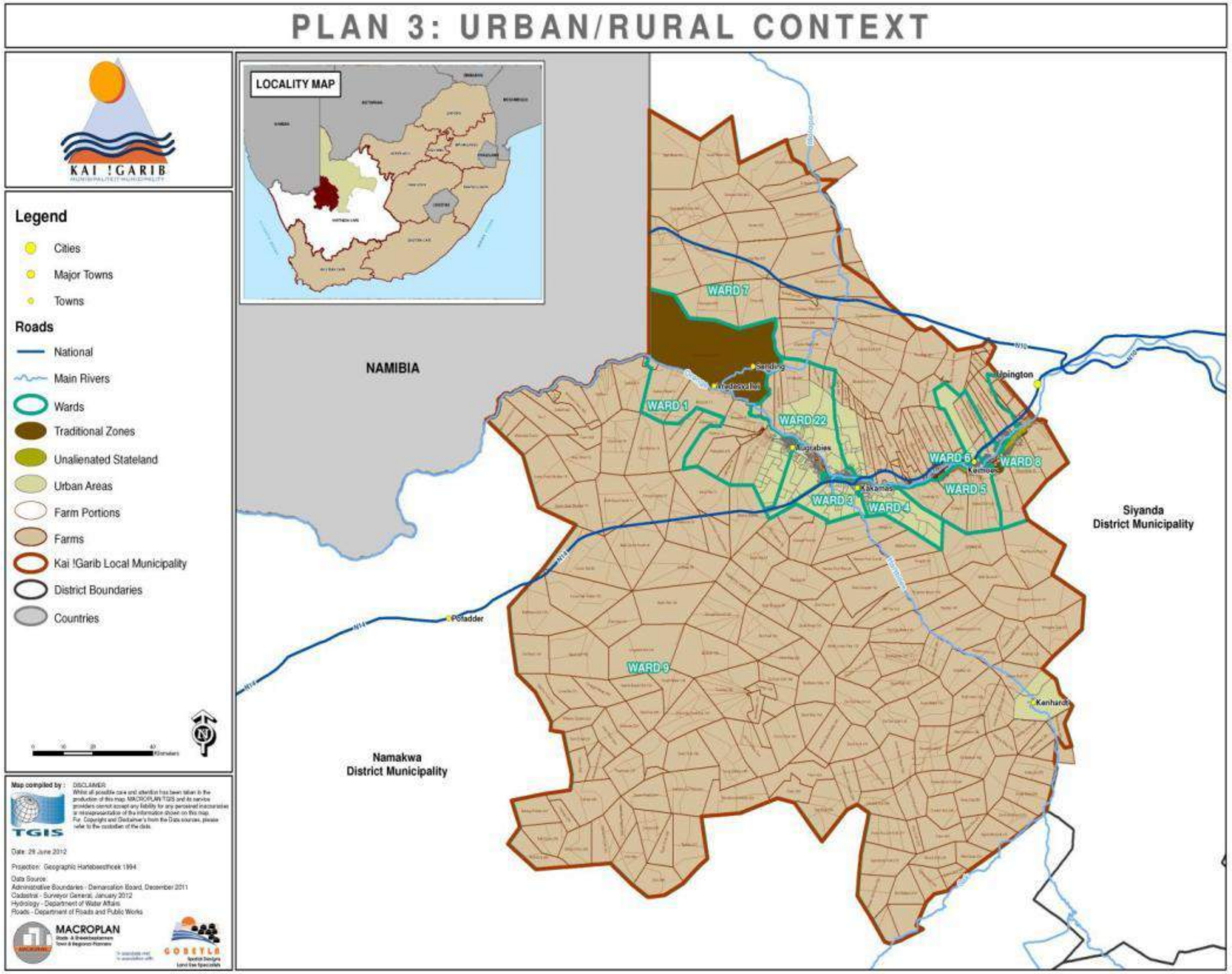

Figure 2: Kai !Garib Local Municipality (Source: Kai !Garib Draft IDP, 2017/18

The major social challenges faced in the Kai !Garib Municipal area include (Kai !Garib Draft IDP, 2014):

- Increases in drug abuse;
- Increases in children under 10 years abusing alcohol;
- Increases in teenage pregnancies;
- Increased crime linked to alcohol and drug abuse;
- High youth unemployment rates; and
- Increased prevalence of HIV & AIDS.

The Kenhardt community appears to have acceptable access to both Human and Social capital. Informants reported that community members are generally in very good health and that most young adults have a secondary education. The high level of unemployment and the increasing number of teenage pregnancies present in Kenhard requires robust social capital to prevent affected community members from falling into abject poverty. The relative success of the local community in preventing this, suggests that access to Social capital is satisfactory.

Access to pysical capital in Kenhardt seems average to low. The community has access to bulk services (water, electricity and waste collection), and a range of housing types ranging from formal to informal. Transport is not a significant factor within Kenhardt, due to its very small size; however, access to other urban areas (e.g. Keimoes, Kakemas and Upington) is limited to private transport. Informants also indicated that access to information and awareness of basic rights and public services are very low. Natural capital in Kenhardt is limited due to the harsh climatic conditions and general lack of irrigation water. As a result, community members appear to have limited access to productive natural assets. Finally, access to financial capital is very limited as the bulk of the vulnerable section of the Kenhardt community seems to be dependent on government subsidies and pensions.

4 IDENTIFICATION OF KEY ISSUES AND ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

By far the most significant driver of change likely to result from the proposed project is the influx of job seekers into the Skeerhok PV 1, 2 and 3 study area, and the corresponding increase in spending and employment. Such an influx of "strangers" into the receiving environment is likely to cause a disturbance in the order of the existing social structure and might also lead to increases in social deviance. Increased spending and employment (even though such employment might be short-term) generates positive impacts through the multiplier effect and by providing much needed financial relief in the area. However, it also creates significant, and often unrealistic, expectations regarding potential employment. **Table 3** below summarizes the impacts from each phase that are anticipated or expected to occur due to the proposed Skeerhok PV projects and transmission line.

The Draft Scoping Report was released for a 30-day comment period which extended from Wednesday 20th September 2017 to Monday 23rd October 2017. The Draft EIA Report is also being released for a 30-day comment period. To date, no specific comments have been raised by I&APs that relate to social impacts.

4.1 Identification of Potential Impacts

Based on the status quo conditions of the study area and the nature of the proposed development, the following social impacts were identified:

- Influx of jobseekers;

- Increases in social deviance;
- Increases in incidence of HIV/AIDS infections;
- Expectations regarding jobs;
- Local spending;
- Local employment;
- Human development resulting from the proposed Economic Development Plan; and
- Job losses at the end of the project life-cycle.

4.2 Residual Impacts

A number of potential negative socio-economic impacts resulting from the proposed Skeerhok projects are likely to persist regardless of proposed mitigation measures. Increases in social deviance are unlikely to be mitigated completely and a certain measure of social disruption and loss of social capital must be accepted as part of the proposed developments. Secondly, an influx of job seekers will occur in spite of the mitigation proposed. In-migration is a double edged sword; as not all in-migration necessary leads to social disruption.

4.3 Cumulative Impacts

Development of more solar energy facilities and associated electrical infrastructure (such as transmission lines) in the study area is likely to negatively impact on biodiversity, farming and tourism. These impacts might further negatively affect local industries, and consequently diminish certain livelihood strategies. However, the relationship of biodiversity, tourism and farming to the majority of local livelihood strategies is weak (CSIR, 2015). As a result, cumulative impacts on biodiversity, tourism and farming in the study area appear to be acceptable.

Similarly, the incidence and severity of the in-migration of job seekers as well as increases in social deviance might increase as more solar energy facilities and associated electrical infrastructure (such as transmission lines) are developed in the study area. This is of importance as several other solar energy developments are being proposed in the Kenhardt area (e.g. the Mulilo Renewable Project Developments (PTY) Ltd Nieuwehoop Phase 1 and Phase 2 solar energy developments). However, such increases are also associated with most other forms of economic and social development and should therefore be expected from any industrial scale developments in the study area.

Finally, the cumulative success of the proposed project and other projects offering significant socio-economic benefits are likely to present a major economic pull factor which might exacerbate in-migration into the study area as well as increases in social deviance. However, the cumulative socio-economic benefit offered by industrial scale development in the study area outweighs the negative impacts associated with economic growth. It should also be borne in mind that influx of job seekers does not necessarily equate in social deviance; i.e. influx of job seekers is a social disruptor which *could* result in social impacts. Given the relative balance between cumulative benefits and impacts, the significance rating ascribed to the cumulative impact of the proposed development is rated as being ***long term to medium term*** in duration, ***local*** in extent and of ***moderate significance*** (negative) rating.

Table 2: Impact rating table

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of impact	Irreplace-ability of receiving environ-ment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confi-dence level
										Without mitigation /management	*With mitigation /management (residual risk/impact)*		
CONSTRUCTION AND OPERATIONAL PHASE													
Impact 1: Influx of job seekers into the Kenhardt area	Disruption of existing social structures	Negative	Local	Medium to Long-term	Substantial	Likely	Low	Moderate	• Develop and implement a Workforce Recruitment Plan • Reserve employment, where practical, for local residents • Clearly define and agree upon the PAP • Develop a database of PAP and their relevant skills and experience • Develop and implement a Stakeholder Engagement Plan	Moderate	Low	4	Medium
Impact 2: Outsiders moves into the Kenhardt area	Increases in social deviance	Negative	Local	Medium-term	Substantial	Likely	Low	Moderate	• Develop and implement a Workforce Recruitment Plan • Reserve employment, where practical, for local residents • Clearly define and agree upon the PAP • Develop a database of PAP and their relevant skills and experience • Develop and implement a Stakeholder Engagement Plan • Delivery on the Economic development Plan must be contractually binding on the proponent	Moderate	Low	4	Medium
Impact 3: Expecta-tions created regarding possible employ-	Increased frustration in the local community	Negative	Local	Short-term	Moderate	Likely	High	Moderate to low	• Develop and implement the Stakeholder Engagement Plan	Low	Very low	5	Medium

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of impact	Irreplace-ability of receiving environ-ment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confi-dence level
										Without mitigation /management	***With mitigation /management (residual risk/impact)***		
ment													
Impact 4: Local spending	Socio-economic benefits as a result of the multiplier effect	Positive	Local	Medium to long-term	Moderate	Likely	n/a	n/a	• Procure goods and services, where practical, within the study area • Obtain regularly required goods and services from as large a selection of local service providers as possible	Low	Low	4	Medium
Impact 5: Local employ-ment	Socio-economic benefits	Positive	Local	Long-term	Substantial	Very likely	n/a	n/a	• Develop and implement a Workforce Recruitment Policy	Moderate	Moderate	3	High
Impact 6: Economic Develop-ment 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
DECOMMISSIONING PHASE													

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of impact	Irreplace-ability of receiving environ-ment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confi-dence level
										Without mitigation /management	*With mitigation /management (residual risk/impact)*		
Impact 7: Decom-missioning of the proposed develop-ment	Job losses	Negative	Local	Long-term	Substantial	Very likely	Moderate	Moderate	• The proponent should comply with relevant South African labour legislation when retrenching employees • Juwi should also implement appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning • All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse	Moderate	Low	4	High
CUMULATIVE IMPACTS													
Exacer-bated in-migration	Disruption of social structures	Negative	Local	Medium to long-term	Substantial	Likely	Low	Moderate	n/a	Moderate	Moderate	3	Medium

5 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The key mitigation measures proposed by the specialist in the reference studies, and which needs to be included in the EMPr are listed below.

Construction and Operational Phase Mitigations:

- Develop and implement a Workforce Recruitment Plan;
- Reserve employment, where practical, for local residents;
- Clearly define and agree upon the Project Affected People (PAP);
- Develop a database of PAP and their relevant skills and experience, or use an existing legitimate database of skills and expertise;
- Develop and implement a Stakeholder Engagement Plan;
- Delivery on the Economic Development Plan must be contractually binding on the proponent;
- Procure goods and services, where practical, within the study area;
- Obtain regularly required goods and services from as large a selection of local service providers as possible;
- The proponent should engage with local NGOs, CBOs and local government structures in the Kenhardt community to identify and agree upon relevant skills and competencies required;
- Such skills and competencies should then be included in the Economic Development Plan; and
- Where possible, align the Economic Development Plan with Local Municipality's IDP.

Decommissioning Phase Mitigations

- The proponent should comply with relevant South African labour legislation when retrenching employees;
- juwi should also consider appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning; and
- All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.

Monitoring recommendations for the above mitigation measures are included in the complete EMPr (included as Part B of the EIA Report).

6 CONCLUSION AND RECOMMENDATIONS

Very little socio-economic data is available for the study area. Census data and information from the Kai !Garib Local Municipality Draft IDP (2014) was obtained for the reference studies; however, these only deal with the larger municipal area and offer no site specific data on socio-economic conditions within and around the town of Kenhardt. Secondary data was subsequently supported by a site visit to Kenhardt during the previous SIAs undertaken. (CSIR, 2015). The site visit's outcome showed that Kenhardt is an area of low employment, substantial poverty and limited livelihood strategies. Access to Human and Social capital appears to be acceptable, while access to Physical capital seems average. However, access to Natural and Financial capital is limited. This constrained access to capital limits the ability of vulnerable members of the community to adapt livelihood strategies should it be required; which results in vulnerability.

The overall significance rating of the *negative* socio-economic impacts associated with the proposed project is ***low to moderate***; whereas the overall significance rating of the *positive* socio-economic impacts associated with the proposed development is ***moderate***.

It should be accepted that the development of the proposed projects is likely 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 medium significance negative impact of the project, as compared to the overall medium-high 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. In addition, the local vulnerability context strongly suggests that acceptable, though declining, levels of Social and Human capital is present within the Kenhardt community, which should assist with the mitigation of potential negative socio-economic impacts resulting from the proposed project. Conversely, very limited Financial capital is available in the local community, which in turn adds to the erosion of existing Social and Human capital. Accordingly, there appears to be a clear need to invest in the development of Financial capital within the Kenhardt community in order to restore some level of balance between asset classes which in turn should facilitate more options to local community members in terms of viable livelihood strategies.

7 INFORMATION SOURCES

The information used for the compilation of this impact statement was drawn from the following sources:

- Du Toit, R. (2015). Social Impact Assessment for proposed Scatec Solar PV Energy Facilities near Kenhardt, Northern Cape Province. Surina Laurie, CSIR, Stellenbosch.
- Du Toit, R. (2014). Social Impact Assessment for the proposed Solar Energy Facilities of the Phase 1 Nieuwehoop Solar PV Park near Kenhardt. Surina Laurie, CSIR, Stellenbosch.
- Du Toit, R. (2015). Social Impact Assessment for the proposed Solar Energy Facilities of the Phase 2 Nieuwehoop Solar PV Park near Kenhardt. Surina Laurie, CSIR, Stellenbosch
- The Kai !Garib Local Municipality Draft IDP of 2014.

8 DECLARATION OF INDEPENDENCE OF SPECIALIST

Mr. Rudolph du Toit has reviewed this statement. Please refer to Appendix A of this Impact Statement for the Curriculum Vitae of Mr. du Toit and his letter (page 1), which confirms that this impact assessment is suitable for this project and in line with his previous studies' findings. The declaration of independence by the specialist is provided below:

BOX 1: DECLARATION OF INDEPENDENCE

I, Rudolph du Toit, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Skeerhok PV Facilities and Transmission Lines Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

RUDOLPH DU TOIT
DATE: 26 January 2018

Appendix A: Curriculum Vitae of the Specialist

APPLIED SCIENCE ASSOCIATES

Curriculum Vitae: Rudolph du Toit

Personal information

Name:	Rudolph du Toit
Firm:	Applied Science Associates (Pty) Ltd
Position in Firm:	Managing Director
Date of Birth:	23 May 1978
Email:	rudolph@appliedscience.co.za
Telephone number:	076 902 6479

Tertiary qualifications

Undergraduate:

Bachelor of Arts (BA) in Environment and Development Studies
Department of Geography and Environmental Studies
University of Stellenbosch (US), 2003-2005

Honours:

Bachelor of Philosophy (B.Phil.) in Development Planning
School for Public Leadership
University of Stellenbosch (US), 2006

Masters:

Master of Philosophy (M.Phil.) in Development Planning
School of Public Leadership
University of Stellenbosch (US), 2007-2009

Academic honours

- Golden Key International Academic Honours Association invitee: 2003 to 2007

- Stellenbosch University Dean's List (Top 10% academic achievers): 2003
- Stellenbosch University Merit Bursary: 2004 & 2005
- Transnet Bursary: 2004
- South African National Energy Research Institute (SANERI) Bursary: 2007 & 2008

Employment experience

1. Organisation: Independent contractor for the CapeNature Working for Water Project
   Position: Team leader: Natural resource management (Alien clearing)
   Period: 1998 to 2001

3. Organisation: Strategic Environmental Focus (SEF) (Pty) Ltd.
   Position: Sustainability coordinator: Environmental planning & reporting
   Period: 2008 to 2010

4. Organisation: Council for Scientific and Industrial Research (CSIR)
   Position: Senior Environmental Planner
   Period: 2010 to 2017

5. Organisation: University of Stellenbosch
   Position: Guest lecturer: Development Planning and Environmental Analysis module (part-time)
   Period: 2013 to present

6. Organisation: University of Stellenbosch
   Position: External moderator of the Honours-level Development Planning course (School for Public Leadership) (part-time)
   Period: 2015 to present

7. Organisation: Applied Science Associates (Pty) Ltd
   Position: Managing Director
   Period: 2017 to present

Professional affiliations

Registered member of the South African Institute for Impact Assessment (IAIA) (Registration number 2779)

Research publications

- Contributing author to: Dalal-Clayton, B. (2013) ***The Role of Strategic Environmental Assessment in Promoting a Green Economy: Background document for the OECD DAC SEA task Team workshop on SEA & Green Economy, Lusaka, 17- 18 January 2013***. IIED, London

- Du Toit, R. (2009). ***Developing a Scorecard for Sustainable Transport: A Cape Town Application.*** Stellenbosch University Press

- Michelle Audouin, Mike Burns, Alex Weaver, David le Maitre, Patrick O'Farrell, Rudolph du Toit, Jeanne Nel. (2015). ***An Introduction to Sustainability Science and its Links to Sustainability Assessment.*** *In Morrison-Saunders, A. and Pope, J., Eds. Handbook of Sustainability Assessment.* Edward Elgar Publishing, 321 -349. ISBN 978-1-78347-136-2

Conference presentations & papers

- Du Toit, R. (2012). **Wind *Energy and Public Participation: A one-sided debate?*** Proceedings of the 17th Annual Conference of the International Association for Impact Assessment South Africa: "Urban Evolution", 27 - 29 August, 2012.
- Du Toit, R. & Van der Westhuizen, C. (2013). ***Strategic Environmental Assessment (SEA) as a means of building the Green Economy in South Africa: The development of a national wind and solar energy roll-out plan.*** Proceedings of the OECD DAC SEA Task Team Workshop on SEA & Green Economy, Lusaka (Zambia), 17- 18 January 2013.
- Burns, M., Du Toit, R. & Schreiner, G. (2013). ***Graphical Causal Loop modelling of socio-ecological systems to identify & evaluate key impact "strings".*** Proceedings of the 18th Annual Conference of the International Association for Impact Assessment South Africa: 16 - 18 September, 2013.

Key courses

- Advanced Facilitation & Experiential Learning: Team Building Institute (Pty) Ltd (2001)
- Clean Development Mechanism (CDM) Project Development Training: Danish Energy Management (Pty) Ltd (2008)
- Project Management Principles & Practice: University of Pretoria (2011)
- Integrating Sustainability with Environmental Assessment in South Africa (Presented by A. Morrison –Saunders & J. Pope): North-West University (2012)
- Science Communication and Working with the Media: Proof Communications/Jive Media Africa (2014)
- Sharpening the Tool: New techniques and methods in Environmental Impact Assessment: Sustainable Environmental Solutions (Pty) Ltd (2015)
- Effective Skills for Challenging Meetings & Engagements: Conflict Dynamics (2015)

Professional experience

The following table presents an abridged list of projects that I have been involved in, indicating my role in each project:

Environmental Impact Assessment (EIA) Experience

Project	Role	Date
1. Basic Assessment: Bottelary Road Upgrade: Van der Merwe Venter Twenty Group and Silmore Trust	Environmental Control Officer	July 2009
2. MTN Remote Hub: Umbutho Civil & Electrical	Environmental Control Officer	July 2009
3. Basic Assessment: Hermanus (Overberg Municipality) substation upgrade & underground cable	Junior Environmental Manager and co-author	August 2009

Page 3 of 8

Environmental Impact Assessment (EIA) Experience

Project	Role	Date
4. Basic Assessment for the InnoWind Swellendam wind energy project: Single test turbine construction	Project manager and lead author	January 2010
5. Basic Assessment for the InnoWind Heidelberg wind energy project: Single test turbine construction	Project manager and lead author	January 2010
6. Basic Assessment for the InnoWind Albertinia wind energy project: Single test turbine construction	Project manager and lead author	January 2010
7. Basic Assessment for the InnoWind Mossel Bay wind energy project: Single test turbine construction	Project manager and lead author	January 2010
8. EIA for InnoWind Swellendam wind energy project, Western Cape	Project manager and lead author	July 2010
9. EIA for InnoWind Heidelberg wind energy project, Western Cape	Project manager and lead author	July 2010
10. EIA for InnoWind Albertinia wind energy project, Western Cape	Project manager and lead author	July 2010
11. EIA for InnoWind Mossel Bay wind energy project, Western Cape	Project manager and lead author	July 2010
12. EIA for the Electrawinds (NL) Coega IDZ Wind Energy Project: Proposed construction of 75 MW installed capacity	Project manager	January 2010
13. EIA for Glencore Exploration (UK): On-shore and off-shore exploration drilling operation; Matanda Block, Cameroon	Project manager	November 2010
14. EIA for Noble Energy (Cameroon): Off-shore exploration drilling, Yoyo Concession and Tilapia Exploration Block, Cameroon	Management, integration and drafting of water quality section of the EIA report.	April 2011
15. EIA for the Vleesbaai Independent Power Producer (VIPP) Wind Energy Facility near Vleesbaai	Project manager and lead author	August 2012
16. Windlab Developments South Africa (Pty) Ltd Ishwati Emoyeni 140 MW Wind Energy EIA near Murrysburg in the Western Cape	Project manager	September 2014
17. EIA for the City of Cape Town 1500 MW Gas-to-power facility, Atlantis, Western Cape	Project leader	July 2015

Strategic Environmental Assessment (SEA) Experience		
Project	**Role**	**Date**
18. Strategic Environmental Assessment (SEA) for the Port of Saldanha: Transnet National Ports Authority (TNPA)	Project manager and lead author	July 2012
19. City of Cape Town Far South Strategic Environmental Assessment (SEA)	Project manager and lead author	June 2014

Social Impact Assessment (SIA) Experience		
Project	**Role**	**Date**
20. Mulilo Renewable Project Developments (Pty) Ltd Gemsbok Solar PV1 75MW Solar Photovoltaic EIA in the Northern Cape	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	September 2014
21. Mulilo Renewable Project Developments (Pty) Ltd Gemsbok Solar PV2 75MW Solar Photovoltaic EIA in the Northern Cape	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	September 2014
22. Mulilo Renewable Project Developments (Pty) Ltd Boven Solar PV1 75MW Solar Photovoltaic EIA in the Northern Cape	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	September 2014
23. Scatec (Pty) Ltd Rugseer Farm Solar PV1 75MW Solar Photovoltaic EIA in the Northern Cape	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	August 2015
24. Scatec (Pty) Ltd Rugseer Farm Solar PV2 75MW Solar Photovoltaic EIA in the Northern Cape	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	August 2015
25. Scatec (Pty) Ltd Rugseer Farm Solar PV3 75MW Solar Photovoltaic EIA in the Northern Cape	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	August 2015
26. SEA for the Square Kilometer Array (SKA) South Africa	Social engagement specialist for the CSIR	September 2015
27. Mainstream Renewable Energy (Pty) Ltd 2 x 140MW Wind Energy Facility EIA near Victoria West	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	April 2016
28. Afdaksrivier Trust Residential Development near Fisherhaven, Western Cape Province	Conducting the Social Impact Assessment (SIA) as part of the suite of EIA specialist studies	August 2017
29. CSIR National Aquaculture Strategic Environmental Assessment (SEA)	Contributing author to the socio-economic impacts chapter of the SEA.	October 2017

Environmental Law Experience		
Project	**Role**	**Date**
30. EIA for InnoWind Swellendam wind energy project, Western Cape	Drafting of appeal against EA refusal by Competent Authority	June 2011
31. EIA for InnoWind Heidelberg wind energy project, Western Cape	Drafting of appeal against EA refusal by Competent Authority	June 2011
32. EIA for InnoWind Albertinia wind energy project, Western Cape	Drafting of appeal against EA refusal by Competent Authority	June 2011
33. EIA for InnoWind Mossel Bay wind energy project, Western Cape	Drafting of appeal against EA refusal by Competent Authority	June 2011
34. Windlab Developments South Africa (Pty) Ltd Ishwati Emoyeni 140 MW Wind Energy EIA near Murrysburg in the Western Cape	Drafting of responding statement in rebuttal of appeal of EA buy I&APs	October 2015
35. Mulilo Renewable Project Developments (Pty) Ltd Gemsbok Solar PV2 75MW Solar Photovoltaic EIA in the Northern Cape	Drafting of appeal against EA refusal by Competent Authority	September 2016
36. Mulilo Renewable Project Developments (Pty) Ltd Gemsbok Solar PV3 75MW Solar Photovoltaic EIA in the Northern Cape	Drafting of appeal against EA refusal by Competent Authority	September 2016
37. Mulilo Renewable Project Developments (Pty) Ltd Boven Solar PV2 75MW Solar Photovoltaic EIA in the Northern Cape	Drafting of appeal against EA refusal by Competent Authority	September 2016
38. Scatec (Pty) Ltd Rugseer Farm Solar PV1 75MW Solar Photovoltaic EIA in the Northern Cape	Drafting of appeal against EA refusal by Competent Authority	October 2016
39. Scatec (Pty) Ltd Rugseer Farm Solar PV2 75MW Solar Photovoltaic EIA in the Northern Cape	Drafting of appeal against EA refusal by Competent Authority	October 2016
40. Scatec (Pty) Ltd Rugseer Farm Solar PV3 75MW Solar Photovoltaic EIA in the Northern Cape	Drafting of appeal against EA refusal by Competent Authority	October 2016
41. EIA for the City of Cape Town 1500 MW Gas-to-power facility, Atlantis, Western Cape	Drafting of appeal against EA refusal by Competent Authority	July 2016

Environmental Management & Sustainability Planning Experience		
Project	**Role**	**Date**
42. Working for Water (CapeNature) alien clearing project: Uniondale Poort	Team Leader: natural resource management	January 1998
43. Working for Water (CapeNature) alien clearing project: Avontuur area	Team leader: natural resource management	March 1999
44. Working for Water (CapeNature) alien clearing project: Prince Alfred	Team leader: natural resource management	January 2000

Environmental Management & Sustainability Planning Experience		
Project	**Role**	**Date**
Pass area		
45. Working for Water (CapeNature) alien clearing project: Langkloof farms	Team leader: natural resource management	February 2001
46. Qualitative Environmental Impact Analysis related to Major Incedent: PetroSA Mossel Bay GTL refinery	Project manager and lead author	October 2010
47. Maseve Platinum Sustainability Assessment, Rustenburg	Project manager	August 2011
48. Notice of Impacts Associated with Exploration Drilling in BHP Billiton Gabon's Licensed Areas of Okondja, Akieni & Lastoursville (Gabon)	Project manager	June 2011
49. PetroSA LNG Importation Pipeline Screening Study (Saldanha Bay to Mosselbay)	Responsible investigating and assessing planning impacts	March 2014
50. Department of Environmental Affairs (DEA) National Sustainable Development Strategy and Action Plan (NSSD) 1: Monitoring & Evaluation Report	Project manager and lead author	November 2013 (on-going)
51. Apollo Brick (Pty) Ltd energy efficiency and fuel switching CDM project	Investigation of possible conversation of the energy efficiency project to an accredited CDM project	January 2008
52. Mxit Lifestyle (Pty) Ltd carbon footprint audit	Carbon audit of Mxit Lifestyle (Pty) Ltd	January 2009
53. EIA for Addax Petroleum: Off-shore exploration/appraisal drilling; Ngosso Permit, Cameroon	Research team: collection of benthic macrofauna samples and bio-indicators for water quality analysis	August 2010
54. EIA for Glencore Exploration (UK): Off-shore exploration drilling, Bolongo Block, Cameroon	Research team: collection of benthic macrofauna samples and bio-indicators for water quality analysis	February 2011
55. Second Integrated State of the Environment Report for Namibia (Phase 1)	Project leader	June 2015
56. Windlab Developments South Africa (Pty) Ltd extension of Environmental Authorisation for the Ishwati Emoyeni 140 MW Wind Energy EIA near Murrysburg in the Western Cape	Project manager	October 2017
57. Calling Education (NPC) Environmental Statement for the proposed Calling Education Secondary School, in Stellenbosch, Western Cape Province	Project manager and lead author	November 2017

Language capability

LANGUAGES	Speaking	Reading	Writing
Afrikaans	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent

References

Dr Michelle Audouin
Senior researcher: CSIR (Sustainability Science Group)
Tel: 021 888 2401
Email: maudouin@csir.co.za

Mr Gerhard Gerber
Director: Development Facilitation Unit (Department of Environmental Affairs & Development Planning; Western Cape)
Tel: 021 483 2787 / 083 226 9127
Email: Gerhard.Gerber@westerncape.gov.za

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX O:

Other

CONTENTS

1. Acknowledgement of Application from DEA

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road, Arcadia · PRETORIA

DEA Reference: 14/12/16/3/3/2/1034
Enquiries: Ms Salome Mambane
Tel: 012 399 9385 **E-mail:** SMambane@environment.gov.za

Kelly Stroebel
Council for Scientific and Industrial Research (CSIR)
PO Box 320
STELLENBOSCH
6065

Tel: 021 888 2432 / 021 888 2561
Email: kstroebel@csir.co.za

PER EMAIL / MAIL

Dear Sir/Madam

ACKNOWLEDGEMENT OF RECEIPT OF THE NEW APPLICATION FOR ENVIRONMENTAL AUTHORISATION (ENVIRONMENTAL IMPACT ASSESSMENT PROCESS) AND SCOPING REPORT FOR THE PROPOSED DEVELOPMENT OF A 100 MW SOLAR PHOTOVOLTAIC FACILITY (SKEERHOK PV 2) ON PORTION 9GEMSBOK BULT FARM 120, NORTH-EAST OF KENHARDT, NORTHERN CAPE PROVINCE

The Department confirms having received the Application for Environmental Authorisation and Draft Scoping Report for the abovementioned project on 19 September 2017. You have submitted these documents to comply with the Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

Please take note of Regulation 40(3) of the EIA Regulations, 2014, as amended, which states that potential Interested & Affected Parties, including the Competent Authority, may be provided with an opportunity to comment on reports and plans contemplated in Regulation 40(1) of the EIA Regulations, 2014, as amended, prior to the submission of an application but must be provided an opportunity to comment on such reports once an application has been submitted to the Competent Authority.

Note that in terms of Regulation 45 of the EIA Regulations, 2014, as amended, this application will lapse if the applicant fails to meet any of the time-frames prescribed in terms of these Regulations, unless an extension has been granted by the Department in terms of Regulation 3(7) of the EIA Regulations, 2014, as amended.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Kindly quote the abovementioned reference number in any future correspondence in respect of the application.

Yours sincerely

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter signed by: Ms Toinette van der Merwe
Designation: Environmental Officer: EIA Coordination, Strategic Planning and Support
Date: 21/09/2017

CC:	Cleo Forster	Juwi Renewable Energies (Pty) Ltd	Email: cleo.forster@juwi.co.za
	Ordain Riba	Department of Environment and Nature Conservation (Kimberly Head Office)	Email: Oriba@ncpg.gov.za / oriba.denc@gmail.com
	Mr Jenkins Esau	!Kheis Local Municipality	Email: Jenkins.esau@gmail.com

2. All comments received by SAHRA at the time of submission of this DEIAR

(Note: Full HIA was uploaded to SAHRIS at the same time as release of this DEAIR, any new comments received will be included in the FEIAR)

Scoping and Environmental Impact Assessment for the proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

Our Ref:

an agency of the Department of Arts and Culture

T: +27 21 462 4502 | F: +27 21 462 4509 | E: info@sahra.org.za
South African Heritage Resources Agency | 111 Harrington Street | Cape Town
P.O. Box 4637 | Cape Town | 8001
www.sahra.org.za

Enquiries: Natasha Higgitt
Tel: 021 462 4502
Email: nhiggitt@sahra.org.za

CaseID: 11819

Date: Friday November 10, 2017
Page No: 1

Interim Comment

In terms of Section 38(3), 38(8) of the National Heritage Resources Act (Act 25 of 1999)

Attention: Ms Cleo Forster
juwi Renewable Energies South Africa (Pty) Ltd

Linked to enhancing its operations within South Africa, the 100 MW Solar PV facility (i.e. Skeerhok PV 2) proposed by juwi will cover an approximate area of 300 hectares (ha). The farm is a total of approximately 2157 ha. Due to the fact that this project only requires 300 ha of land, there is scope to avoid major environmental constraints through the final design of the facility within the development footprint. Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

The CSIR was appointed by juwi Renewable Energies (Pty) Ltd to conduct a Scoping and Environmental Impact Assessment (S&EIA) Process in support of an Environmental Authorisation Application for the Proposed Skeerhok PV 2, on portion 9 of Gemsbok Bult 120, near Kenhardt, Northern Cape Province.

A Scoping Report will be completed in terms of the National Environmental Management Act, 1998 (NEMA) and the 2017 EIA Regulations. The proposed development will comprise the construction of a 100MW Solar Energy Facility (SEF) with a total buildable area of 300 ha.

ASHA Consulting (Pty) Ltd has been appointed to conduct the Heritage Component of the S&EIA process.

Orton, J. 2017. Scoping Inputs for the Proposed Skeerhok PV 1, PV2 and PV3 Solar Energy Projects.

The Heritage Scoping Report identified Later Stone age artefacts in a two small pans within the proposed development area.

Recommendations provided in the report include the following:

- It is recommended that the development avoid the pans;
- A walk-down of the final layout to determine if any significant sites will be affected.

Interim Comment

Scoping and Environmental Impact Assessment for the proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province
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Enquiries: Natasha Higgitt
Tel: 021 462 4502
Email: nhiggitt@sahra.org.za
CaseID: 11819

Date: Friday November 10, 2017

SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes that a Heritage Scoping Input has been submitted, and therefore awaits the pending Heritage Impact Assessment (HIA) as part of the draft EIA Phase.

The pending HIA must assess all heritage resources as defined in section 3(2) of the National Heritage Resources Act, Act 25 of 1999 (NHRA) and the report must comply with section 38(3) of the NHRA. The Archaeological and Palaeontological components of the HIA must comply with the SAHRA 2006 Minimum Standards for Archaeological and Palaeontological Components of Impact Assessments and the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Additionally, the Visual Impact of the proposed development on heritage resources and any comments provided by the public regarding heritage resources must be taken into consideration. The Scoping report appendices, the draft EIA with all appendices must be submitted along with the heritage reports in order for further comments to be issued.

Should you have any further queries, please contact the designated official using the case number quoted above in the case header.

Yours faithfully

Natasha Higgitt
Heritage Officer
South African Heritage Resources Agency

Phillip Hine
Acting Manager: Archaeology, Palaeontology and Meteorites Unit
South African Heritage Resources Agency

3. Confirmation from DEA (Mr. Coenrad Agenbach) that any listed activities pertaining to battery storage are not triggered

From: Coenrad Agenbach [mailto:Cagenbach@environment.gov.za]
Sent: Monday, November 20, 2017 8:31 AM
To: van der Westhuizen, Corne
Cc: Franz Scheepers
Subject: RE: IQ/17/0449: Battery Storage

Dear Corné

Our telephone conversation last week and the e-mail below refer. I concur with the interpretation below. Battery storage was included in the EAs for the 3 Kronos projects and no risk assessment is required. As confirmed in our conversation, should any new applications be lodged, all infrastructure/components within the development footprint of the facility must be assessed, whether listed or not listed.

Regards

Coenrad Agenbach
Control Environmental Officer (Grade B):
Integrated Environmental Authorisations
Strategic Infrastructure Development
Department of Environmental Affairs
Private Bag X447
Pretoria
0001
South Africa

Telephone: + 27 12 399 9403

From: van der Westhuizen, Corne [mailto:corne.vanderwesthuizen@juwi.co.za]
Sent: 06 November 2017 11:39 AM
To: Coenrad Agenbach
Cc: Bellingham, Christopher; Muhammad Essop
Subject: FW: IQ/17/0449: Battery Storage

Hi Coenrad,

Please see below clarification from IQ. According to this clarification battery storage does not trigger the dangerous goods listed activities and would therefore not require a Risk Assessment or any additional assessment as part of the EIA process.

Please confirm this is also the EIA implementation unit's view.

Best regards,

Corné van der Westhuizen M.Sc. (Env), MBA
Project Development Manager
Tel. +27. (0)21. 831 6129 · Mobile +27 (0) 83 611 7073 · Fax. +27. (0) 21 831 6199 ·
corne.vanderwesthuizen@juwi.co.za<mailto:corne.vanderwesthuizen@juwi.co.za>

From: IQ [mailto:IQ@environment.gov.za]
Sent: Thursday, October 26, 2017 1:17 PM
To: van der Westhuizen, Corne
Cc: Susara Burger; Betty Mdala; Tinyiko Mboweni; Mary Katerere; Franz Scheepers
Subject: IQ/17/0449: Battery Storage

Dear Corne

Your enquiry below refers. Based on the information provided please note the following:-

- All 3 of the attached environmental authorisations (EAs) authorises a number of identified activities for the development of PV facility, including associated infrastructure such as service road, access road and collector substation with battery facility for grid storage. In this regard the EA already authorised the battery facility of the PV facility.

- It is important to note that the identified activities relating to storage of dangerous goods, such as Activity 14 of Listing Notice 1 and Activity 10 of Listing Notice 3, will not be triggered by the proposed battery facility installation in the scenario specified below, due to the following:-

  - A battery is not deemed to be a container.

  - Electrolytes that are used within battery storage facilities: their function is deemed to be similar to transformers within substations: converting high voltage electricity to lower voltage electricity for further distribution. The function of the battery is not for storage or storage and handling of a dangerous good.
- The IQ helpdesk is not in possession of a copy of the approved final site layout plan(s). If the battery facilities will be installed in line with the authorised project description and or the approved final site layout plan (i.e. there are no changes to e.g. location or size of the batteries), no application for amendment of the EAs will be required.
- Furthermore, all of the attached 3 EAs authorised the 'clearance of indigenous vegetation' activities. If such clearance will be done within the authorised project description and or the approved final site layout plan then such clearance of indigenous vegetation will not require a new EA as this is already authorised.
- In the scenarios specified below, if the battery facilities and the clearance of indigenous vegetation will be done outside the ambit of the authorised A, including the project description and or the approved final site layout plan then an amendment of the EAs will be required. Clause 5 of Scope of Authorisation of the attached EAs also provides that any changes or deviations to the project description must be approved by the Department before such changes or deviations are effected. If the proposed changes will not change the scope of the valid EAs then a Part 1 amendment will be required. However if the proposed changes will change the scope of the EAs a Part 2 amendment will be required.

Kind Regards,

Mary Katerere
Law Reform and Appeals: Framework and Policy Support
Environment House
Cnr. Steve Biko and Soutpansberg Road, Pretoria
Tel: 0123999181
Fax: 0123593693

From: van der Westhuizen, Corne [mailto:corne.vanderwesthuizen@juwi.co.za]
Sent: Tuesday, 24 October 2017 13:39
To: Mary Katerere
Subject: RE: Clarification - Battery Storage IQ/17/0449

Hi Mary,

Thanks for the quick reply. In response to your questions:

1. Please find EAs attached. You will see that it was a three phased development, thus 3 EIAs and 3 EAs.

2. DEA requested the additional assessment in terms of the battery storage in a rejection letter during the final decision making period on the FEIAR. See point (e) in the attached rejection letter.

3. No listed activities were actually removed. The intention was never for the battery storage facility to have more than 80m3 of dangerous goods, and therefore this activity was never listed and the risk assessment not undertaken as part of the EIA process.

4. Will be located next to the onsite substation in each of the phases. See dark areas demarcated next to substations in attached design plan.

Please let me know if you have any further question or need additional information.

Best regards,

Corné van der Westhuizen M.Sc. (Env), MBA
Project Development Manager
Tel. +27. (0)21. 831 6129 · Mobile +27 (0) 83 611 7073 · Fax. +27. (0) 21 831 6199 ·
From: Mary Katerere [mailto:MKaterere@environment.gov.za]
Sent: Tuesday, October 24, 2017 12:46 PM
To: van der Westhuizen, Corne
Subject: FW: Clarification - Battery Storage IQ/17/0449

Dear Corne

Further to our telephonic discussion and your email below please kindly provide us with the following additional information:-

- a copy of the EA.
- When did DEA request the removal of the battery storage facility, and associated Listed Activities? Please kindly provide us with this correspondence.
- Which associated Listed activities for the battery storage facility were removed from the assessment?
- Where will the battery storage facility be located in relation to the approved facility?

Kind Regards,

Mary

From: van der Westhuizen, Corne [mailto:corne.vanderwesthuizen@juwi.co.za]
Sent: Tuesday, October 24, 2017 9:37 AM
To: IQ
Subject: Clarification - Battery Storage

Dear IQ,

Can you please provide clarification on the following issue.

Background:

- As part of an EIA for a PV facility battery storage with its associated Listed Activities (i.e. storage of >80 m3 dangerous goods) were included in project description
- DEA requested the battery storage facility, and associated Listed Activities, to be removed due to inadequate assessment (i.e. the lack of a dedicated risk assessment study)
- The project was thus approved by DEA without the battery storage component.

Clarification Question:

- Can you please confirm our understanding that no further authorisations or amendments would be required if we intend on installing a battery storage facility that triggers no listed activities (i.e. small clearance footprint and dangerous goods less than the 80 m3 threshold outside protected or sensitive CBA areas)?

Looking forward to your response.
Best regards,
Corné van der Westhuizen M.Sc. (Env), MBA
Project Development Manager
Tel. +27. (0)21. 831 6129 · Mobile +27 (0) 83 611 7073 · Fax. +27. (0) 21 831 6199 ·
corne.vanderwesthuizen@juwi.co.za<mailto:corne.vanderwesthuizen@juwi.co.za>

4. Confirmation of provision of municipal services (Manager: Project Management Unit at Kai

Munisipaliteit Kai !Garib Municipality

Munisipale Gebou
11de Laan
Tel 054 461 6400
Faks 086 516 9066
E-Pos: mm@kaigarib.gov.za
Privaatsak X 6
KAKAMAS
8870
BTW Reg Nr. 4170193371

KAI !GARIB
JG Lategan
Handel met bierdie saak

Municipal Building
11th Avenue
Tel 054 461 6400
Fax 086 516 9066
E-Mail: mm@kaigarib.gov.za
Private Bag X 6
KAKAMAS
8870
VAT Reg No. 4170193371

13 December 2017
Juwi Renewable Energies (Pty) Ltd
7 Walter Sisulu Avenue
Foreshore
CAPE TOWN
8001

SKEERHOK PF FACILITY: WATER, SEWERAGE AND WASTE REMOVAL REQUIREMENTS

Your email, dated Thursday, 07 December 2017, to Mr J Mac Kay, Director Planning & Development of Kai !Garib Municipality, has relevance.

Council hereby, in principle approve the supply of potable water for staff needs – which we will be able to meet during the construction and operational phases. Our agreement with the Department of Water & Sanitation prevent us from supplying water for construction – this you have to source from groundwater facilities in the area.

Our licensed solid waste site in Kenhardt are available for all solid waste as stipulated in the waste license attached. The removal of waste from your site will be done by your vehicles and delivered to the site at R524 per ton or part thereof.

The oxidation ponds are able to process the estimated volumes indicated in your letter but our honey sucker will not be able to service the plant due to the gravel road. Our tariffs are as follows:

1. Sewerage volume R300/kl
2. Distance from oxidation ponds R25/km

Please address any queries to Mr J Mac Kay.

Yours truly

JG LATEGAN
ACTING MUNICIPAL MANAGER

!Garib Municipality)

MUNISIPALITEIT KAI !GARIB - DIENSTETARIEWE 2017/18
BTW UITGESLUIT

Annexure B

KODE	ELEKTRISITEITVOORSIENING - STEDELIK	TARIEWE 2017/18		
		EENHEID	BASIES	PER KVA
	Voorafbetaal meters			
EP01	Huishoudelik: Hulpbehoewende verbruikers: Block 1 (0-350kwh)	134,30c		
	Huishoudelik: Hulpbehoewende verbruikers: Block 2 (> 351 kwh)	151,30c		
EP02	Huishoudelik: 1x60 amp: Block 1 (0 - 350kwh)	158,06c		
	Huishoudelik: 1x60 amp: Block 2 (> 350 kwh)	158,81c		
EP03	Kommersieel: 1x60 amp: Block 1 (0 - 350kwh)	190,81c		
	Kommersieel: 1x60 amp: Block 2 (> 351 kwh)			
EP04	Kommersieel: 3x60 amp	190,81c		
	Kleinmaat			
E001	Huishoudelik: 1x5 amp - 1x60 amp: Block 1 (0 - 350kwh)	135,85c	R 226,80	
	Huishoudelik: 1x5 amp - 1x60 amp: Block 2 (> 351 kwh)	149,73c		
E003	Huishoudelik: 3x5 amp - 3x60 amp: Block 1 (0 - 350kwh)	135,85c	R 352,00	
	Huishoudelik: 3x5 amp - 3x60 amp: Block 2 (> 351 kwh)	149,73c		
E005	Kommersieel: 1x5 amp - 1x60 amp:	146,31c	R 666,24	
E006	Kommersieel: 3x5 amp - 3x60 amp:	146,31c	R 1 116,59	
E015	Kommersieel: 3x70 amp - 3x100 amp:	146,31c	R 1 503,68	
	Grootmaat verbruikers			
E008/EK08	Grootmaat: Laagspanning metering : - 110 amp - 150 amp	87,33c	R 1 570,68	R 198,65
E009/EK09	Grootmaat: Hoogspanning metering : -> 150 amp	87,33c	R 1 570,68	R 198,65
	Verligting			
E010	Straatligte	33,00c	R 945,11	
E011	Hoëmasligte	92,85c	R 962,88	
	Ander			
E012	Beskikbaarheidsgelde: Residensieel		R 143,60	
E013	Beskikbaarheidsgelde: Besigheid en Nywerheid		R 143,60	

KODE	ELEKTRISITEITSVOORSIENING - LANDELIK	TARIEWE 2017/18		
		EENHEID	BASIES	PER KVA
	Voorafbetaal meters			
EP01	Huishoudelik: Hulpbehoewende verbruikers: Block 1 (0-350kwh)	134,30c		
	Huishoudelik: Hulpbehoewende verbruikers: Block 2 (> 351 kwh)	151,30c		
EP02	Huishoudelik: 1x60 amp: Block 1 (0 - 350kwh)	158,06c		
	Huishoudelik: 1x60 amp: Block 2 (> 351 kwh)	158,81c		
EP03	Kommersieel: 1x60 amp:	190,81c		
EP04	Kommersieel: 3x60 amp:	190,81c		
	Kleinmaat			
E021	Huishoudelik: 1x5 amp - 1x60 amp: Block 1 (0 - 350kwh)	135,85c	R 226,80	
	Huishoudelik: 1x5 amp - 1x60 amp: Block 2 (> 351 kwh)	149,73c		
E023	Huishoudelik: 3x5 amp - 3x60 amp: Block 1 (0 - 350kwh)	135,85c	R 352,00	
	Huishoudelik: 3x5 amp - 3x60 amp: Block 2 (> 351 kwh)	149,73c		
E026	Kommersieel: 1x5 amp - 1x60 amp:	146,31c	R 666,24	
E027	Kommersieel: 3x5 amp - 3x60 amp:	146,31c	R 1 116,59	
E029	Kommersieel: 3x70 amp - 3x100 amp:	146,31c	R 1 503,68	
	Grootmaat verbruikers			
E030/EK30	Grootmaat: Laagspanning metering : - 110 amp - 150 amp	87,33c	R 1 570,68	R 198,65
E031/EK31	Grootmaat: Hoogspanning metering : -> 150 amp	87,33c	R 1 570,68	R 198,65

MUNISIPALITEIT KAI !GARIB - DIENSTETARIEWE 2017/18
ETW UITGESLUIT

Annexure C

KODE	WATERVOORSIENING	TARIEWE 2017/18		
		EENHEID	BASIES	
W001	Kleinmaat - (20 - 25 mm aansluiting)		R 69,00	
W002	Grootmaat (50 mm aansluiting)		R 367,58	
W003	Grootmaat (75 mm aansluiting)		R 2 336,27	
W004	Grootmaat (100 mm aansluiting)		R 6 093,58	
	Rouwater		R 277,03	
W006	Beskikbaarheid residensieël		R 69,00	
W007	Beskikbaarheid besighede en nywerhede		R 69,00	
	- Verbruik - 0 tot 6 kl/ maand (6)	R 6,01		
	- Verbruik - 7 tot 20 kl/ maand (14)	R 5,53		
	- Verbruik - 21 tot 30 kl/maand (10)	R 6,00		
	- Verbruik - 31 tot 50 kl/maand (20)	R 6,59		
	- Verbruik - Bo 50 kl/maand (>50)	R 7,77		
	Gesuiwerde Water - Prepaid			
	- "PREPAID" Verbruik - 0 tot 6 kl/maand (6)	R 6,60		
	- "PREPAID" Verbruik - 7 tot 20 kl/ maand (14)	R 6,25		
	- "PREPAID" Verbruik - 21 tot 30 kl/maand (10)	R 7,20		
	- "PREPAID" Verbruik - 31 tot 50 kl/maand (20)	R 7,80		
	- "PREPAID" Verbruik - Bo 50 kl/ maand (>50)	R 8,40		
	Platrate		R 109,48	

Annexure D

KODE	RIOOLAFVALVERWYDERING	TARIEWE 2017/18		
		EENHEID	BASIES	
	SUIGTENKS			
S001	Basiese fooi		R 152,49	
	Suigtenk Vraggeld per kiloliter (vooraf betaalbaar):			
S001/S011	_Stedelik (Per KL)		R 8,00	
S002	_Landelik (Per KL)		R 300,00	
S003	Rittooie per kilometer (Vanaf die eerste 100km)		R 25,00	
S004	Sanitasieemmers		R 138,61	
	RIOOLGELDE			
A001	Residensieël: Stedelike Gebied		R 152,49	
A002	Kerke & Sale		R 152,49	
A003	Klein Besighede (<200kl/mnd)		R 446,77	
A004	Groot Besighede (>200kl/ mnd); Kokerboom Resort, BK Clubhuis		R 959,75	
A005	Skole (<500kl/mnd), Koshuise, SAPD & Hotelle		R 2 799,06	
A006	Skole (>500kl/mnd), Hospitale		R 6 109,49	

Annexure E

KODE	REINIGINGSDIENSTE	TARIEWE 2017/18		
		EENHEID	BASIES	
R001	Huishoudelik, Klein kantore en Kerke (1verw/week)		R 94,55	
R002	Besighede, Skole, Koshuise, Hotelle en Verblyfsondernemings (2 verw/week)		R 257,88	
R003	Grootmaarvullis (Hokke)		R 386,51	
R004	Grootmaarvullis ([illegible])		R 242,63	
R005	Grootmaarvullis (per ton)		R 524,00	

the denc

Department:
Environment & Nature Conservation
NORTHEN CAPE PROVINCE
REPUBLIC OF SOUTH AFRICA

Private Bag X6102, Kimberley, 8300, SASKO Building, Tel: 053-807 7430, Fax: 053-831 3530

Enquiries : Dipatlisiso : Navrae : Imibuzo :	D Kgosi	Date : Letlha : Datum : Umhla :	31 October 2014
Reference : Tshupelo : Verwysing : Isalathiso	16/2/7/D11/Z1/P452		

The Municipal Manager
Kai! Garib Local Municipality
Private Bag X6
Kakamas
8870

Fax: (086) 502 8887

Dear License holder

WASTE LICENSE FOR THE OPERATION OF THE KENHARDT GENERAL WASTE DISPOSAL SITE, KAI! GARIB LOCAL MUNICIPALITY IN TERMS OF SECTION 20(b) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008

Please find hereto attached waste licence for Kai! Garib Local Municipality for the above mentioned activity. The license application form was submitted on the 20th February 2014 and the Pollution and Waste Management unit within the Environment Quality Management Directorate reviewed the documents submitted and concluded the application as per the National Environmental Management: Waste Act, 2008, (Act 59 of 2008)

This letter serves to inform you that your waste license application for the above mentioned activity in the location as per the coordinates in the application has been issued.

Yours Sincerely

PP

Mr B D Fisher
Acting Director: Environmental Quality Management
Date: 31 October 2014

Copy: ***Mr J van Huyssteen***
MBB Consulting engineering South (PTY) LTD

the denc

Department:
Environment & Nature Conservation
NORTHERN CAPE PROVINCE
REPUBLIC OF SOUTH AFRICA

Private Bag X6102, Kimberley, 8300, SASKO Building, Tel: 053-807 7430, Fax: 053-831 3530

Ref: 16/2/7/D530/D11/Z1/P452
Enquiries: Martha S. Molokwane
Tel: (054) 338-4800 **Fax:** (054) 331-1155 **Email:** mmolokwane@ncpg.gov.za

PERMIT NUMBER:	16/2/7/D530/D11/Z1/P452
CLASS:	G: C: B-
WASTE FACILITY:	KENHARDT GENERAL WASTE DISPOSAL SITE
LOCATION:	PART OF PORTION 1049 OF THE FARM KENHARDT, KENHARDT
PERMIT HOLDER:	KAI! GARIB MUNICIPALITY
ADDRESS:	PRIVATE BAG X6, KAKAMAS, 8870
CONTACT PERSON:	THE MUNICIPAL MANAGER
CONTACT DETAILS:	TEL: (054) 461 6400, FAX: (086) 502 8887

PERMIT IN TERMS OF SECTION 20 OF ENVIRONMENT CONSERVATION ACT, 1989 (ACT 73 OF 1989)

I, Bryan D. Fisher, in my capacity as Acting Director: Environmental Management Quality Management of the Department of Environment and Nature Conservation (hereinafter referred to as "the Department"), in terms of section 20(1) of the Environmental Conservation Act, 1989 (Act 73 of 1989) (as amended), hereby authorise the abovementioned Permit Holder to establish and operate the abovementioned waste disposal site, subject to the conditions specified herein.

PERMIT CONDITIONS

In this Permit, "Acting Director" means the Director of Environmental Quality Management of the Northern Cape Department of Environment and Nature Conservation who may both be contacted at the address below:

Director: Environmental Quality Management
Department of Environment and Nature Conservation
Private Bag X 6010
Kimberley
8301

In this Licence, "Director-General" means the Director-General of the Department of Water and Sanitation who may be contacted at the address below:

Director-General
Department of Water and Sanitation
Private Bag X 313
PRETORIA
0001

1. LOCATION

1.1 This Permit authorises the establishment, development and operation of a waste disposal site on part of Portion 1049 of the farm Kenhardt, Kai! Gaib Municipality, Z. F. Mgcawu District (hereinafter referred to as "the Site").

1.2 The location of the site must be according to co-ordinates submitted by the Permit holder on the 21 October 2014 is defined as follows:

Latitude	Longitude
3 245 389.208	14 616.018
3 245 400.548	14 705.301
3 245 251.743	14 724.200
3 245 240.404	14 634.918

2. PERMISSIBLE WASTE

2.1 The Site may be used for the disposal of all waste types, excluding those listed in Annexure I and excluding those where specific control has been established in terms of the Nuclear Energy Act, 1982 (Act 92 of 1982). Waste types controlled in terms of the Minerals Act, 1991 (Act 50 of 1991) and the Electricity Act, 1987 (Act 41 of 1987) are also excluded from disposal on the Site unless written permission has been obtained from the Regional Director.

2.2 The Permit Holder must take all reasonable steps to ensure that-

2.2.1 no organic or inorganic element or compound which may have a definite acute or chronic negative effect on human health and/or the environment, due to its toxic, physical, chemical or persistent characteristics and which corresponds with the UNEP definition of hazardous waste;

2.2.2 no medical waste; and

2.2.3 no scheduled pharmaceutical products registered in terms of the Medicines and Related Substances Control Act, 1965 (Act 101 of 1965) or associated containers, are disposed of on site.

3. CONSTRUCTION

3.1 The Site or any portion thereof may only be used for the disposal of permissible waste if the Site or any such portion has been constructed or developed according to condition 3 of this Permit.

3.2 Construction and further development within the Site shall be done under the supervision of a suitably qualified person proposed by the Permit Holder and approved by the Director-General.

3.3 After construction of the Site or further development within the Site, the Permit Holder shall notify the Director or/and the Director-General thereof, and the person referred to in condition 3.2 shall submit a certificate or alternatively a letter to the Director or/and the Director-General that the construction of the Site or further development within the Site, as proposed by the Permit Holder and approved by the Director or/and the Director-General, is in accordance with recognised civil engineering practice before disposal may commence on the Site. The completed construction works of the Site shall be inspected by an official of the Department and the person referred to in condition 3.2. If the Director or/and Director-General is satisfied with the construction of the Site or any further development within the Site and has given written permission, the Permit Holder may use the Site or any further development within the Site for the disposal of waste.

3.4 The Permit Holder shall take all reasonable steps, such as suitable zoning and/or written agreements with adjacent landowners, to establish and maintain an unbuilt area or "buffer zone" of 200 metres between the Site and the nearest residential and/or light industrial areas during the operative life of the Site. Heavy industries or industries which may create nuisance conditions may be permitted within the buffer zone in terms of the appropriate legislation.

3.5 Work shall be constructed and maintained on a continuous basis by the Permit Holder to divert and drain from the Site in a legal manner, all runoff water arising on land adjacent to the Site, which could be expected as a result of the estimated maximum precipitation during a period of 24 hours with an average frequency of one in every fifty years (50) (hereinafter referred to as the "estimated maximum precipitation"). Such works shall, under the said rainfall event, maintain a freeboard of half a metre.

3.6 Works shall be constructed and maintained on a continuous basis by the Permit Holder to divert and drain from the working face of the Site, all runoff water arising on the Site, which could be expected as a result of the estimated maximum precipitation and to prevent such runoff water from coming into contact with leachate from the Site. Such works shall, under the said rainfall event, maintain a freeboard of half a metre.

3.7 Runoff water referred to in condition 3.6 shall comply with the quality requirements of the General Standard, prescribed in terms of section 21(1) (a) of the Water Act, 1956 as published in Government Notice 991 of 18 May 1984, or with such quality requirements as may from time to time be determined by the Minister and shall be drained from the Site in a legal manner.

3.8 Runoff water referred to in condition 3.6 which does not comply with the quality requirements applicable in terms of condition 3.7 shall, by means of works which shall be constructed and maintained on a continuous basis by the Permit Holder –

3.9 be treated to comply with the aforementioned standard and discharged in a legal manner; and/or,

3.8.1 with the written approval of the Director-General be evaporated in dams and/or be evaporated by spraying over those portions of the Site which comply with the requirements set in terms of condition 3.1.

3.9 The Site shall be constructed in accordance with recognised civil engineering practice to ensure that it remains stable.

3.10 The maximum height of the Site above ground level shall not exceed 3.5 metres.

3.11 The slope of the sides of the Site shall be constructed in such a manner that little or no erosion occurs.

3.12 The Permit Holder shall make provision for adequate sanitation facilities on the Site.

4. ACCESS CONTROL

4.1 Weatherproof, durable and legible notices in at least three official languages applicable in the area, shall be displayed at each entrance to the site. These notices shall prohibit unauthorised entry and state the hours of operation, the name, address and telephone number of the Licence Holder and the person responsible for the operation of the Site.

4.2 The Site shall be fenced and/or secured to reasonably prevent unauthorised entry.

4.3 The Permit Holder shall take all reasonable steps to maintained service roads in a condition which ensures unimpeded access to the Site for vehicles transporting waste and keep the roads free of waste.

4.4 The Permit Holder shall ensure effective access control.

4.5 The Permit Holder shall take all reasonable steps to prevent the disposal of waste on the Site for which the Site has not been approved.

5. OPERATION

5.1 Waste disposed of on the Site shall be covered on a weekly basis with a minimum of 150 millimetres of soil or other material approved by the Director.

5.2 Waste disposed of on the Site may be reclaimed. The reclamation activity shall not interfere with the daily operational activities of the Site. The relevant Government Notice 926, National Norms and Standards for the storage of waste may be applicable.

5.3 The Permit Holder shall take all reasonable steps to ensure that the Site is operated in a manner that shall prevent the creation of nuisance conditions or health hazards.

5.4 The Permit Holder shall keep a record of the volume and nature of the waste materials which are reclaimed and report this on an annual basis to the Director.

6. MONITORING

6.1 Further monitoring

If, in the opinion of the Director, environmental pollution, nuisances or health risks may be or are occurring on the Site, the Licence Holder must initiate an investigation into the cause of the problem or suspected problem. Should the investigation reveal any unacceptable levels of pollution, the Licence Holder must submit mitigatory measures to the satisfaction of the Director.

7. METHODS OF ANALYSIS

7.1 The Permit Holder shall carry out all tests in accordance with methods prescribed by and obtainable from the South African Bureau of Standards (SABS), referred to in the Standard Acts, 1982 (Act 30 of 1982), to analyse the samples taken under the monitoring programmes specified in condition 6.

7.2 The Permit Holder shall only use another method of analysis if written proof that the method is equivalent to the SABS method, is submitted to the Director and/or Director-General.

8. AUDITING

8.1 DEPARTMENTAL AUDITS AND INSPECTIONS

8.1.1 The Department reserves the right to audit and/or inspect the site at any time and at a frequency decided by the Director.

8.1.2 The Licence Holder must make any records or documentation available to the Director: upon request, as well as any other information the Director may require.

8.1.3 The findings of these audits or inspections must be made available to the Licence Holder within 60 days of the end of the audit or inspection. Information from the audits must be treated in accordance with the Promotion of Access to Information Act, 2000 (Act 2 of 2000).

9. RECORDING

9.1 The Licence Holder must keep records and update all the information referred to in Annexure II and submit this information to the Director and/or Director-General on an annual basis.

10. REPORTING

10.1 The Licence Holder must, within 24 hours notify the Director and/or Director-General of the occurrence or detection of any incident on the Site, or incidental to the operation of the site, which has the potential to cause, or has caused pollution of the environment, health risks, nuisance conditions or water pollution.

10.2 The Licence Holder must within 14 days submit an action plan which must include a detailed time schedule, to the satisfaction of the Director on measures taken to –

(a) correct the impact resulting from the incident;

(b) prevent the incident from causing any further impact; and

(c) prevent a recurrence of a similar incident.

10.3 The Licence Holder must submit a written report to the Director and/or Director-General regarding any deviations from plans described in this Licence and must obtain written permission from the Director-General before such deviations may be implemented.

11. LEASING AND ALIENATION OF THE SITE

11.1 Should the Permit Holder want to alienate or lease the site, he/she must notify the Director and/or Director-General in writing of such an intention at least 60 days prior to the said transaction.

12. GENERAL

12.1 This Permit shall not be construed as exempting the Permit Holder from compliance with the provisions of the National Environmental Management Act, 1998 (Act 107 of 1998), the Health Act,1977 (Act 63 of 1977), the National Water Act, 1998 (Act 36 of 1998) or any other applicable act, ordinance, regulation or by-law.

Mr. B. D. FISHER

ACTING DIRECTOR- ENVIRONMENTAL QUALITY MANAGEMENT

DATE: 30-10-2014

ANNEXURE I

LIST OF HAZARDOUS OR TOXIC MATERIALS WHICH MAY NOT BE DISPOSED OF ON A GENERAL WASTE DISPOSAL SITE

1. Waste where specific control has been established in terms of the Nuclear Energy Act, 1999 (Act 46 of 1999).

2. Waste types controlled in terms of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) and the Electricity Act, 1987 (Act 41 of 1987), Nuclear Energy Act, 1999 (Act 46 of 1999), unless written permission has been obtained from the HOD.

3. Waste which is defined, according to the Minimum Requirements, as an extreme hazard or Hazard Group 1 (HG1); high hazard or Hazard Group 2 (HG2); moderate hazard or Hazard Group 3 (HG3) and low hazard or Hazard Group 4 (HG4),

4. Flammable wastes, with a closed cup flash point less than 61°C.

5. Corrosive substances, as defined and described in the Minimum Requirements as Class 8 (1998 edition: page 6-8, Diagram III).

6. Oxidising substances and organic peroxides, as defined and described in the Minimum Requirements as Class 5 (1998 edition: page 6-8, Diagram III).

7. Any waste with a substance which is a Group A and/or Group B carcinogen/mutagen. A carcinogens / mutagens have been proven in humans, both clinical and epidemiological. Group B Group carcinogens/mutagens have been proven without doubt in laboratory animals.

8. Any waste with a substance at a concentration greater than 1% where the substance is a Group C and/or Group D carcinogen/mutagen. Group C carcinogens/mutagens have shown limited evidence in animals. Group D carcinogen/mutagen - the available data is inadequate and doubtful

9. Any infectious waste which is generated during the diagnosis, treatment or immunisation of humans or animals; in the research pertaining to this; in the manufacturing or testing of biological agents including blood, blood products and contaminated blood products, cultures, pathological wastes, sharps, human and animal anatomical wastes and isolation wastes that contain infectious substances.

10. All materials which fall in Class 1 (explosives), Class 2 (compressed gases) and Class 7 (radioactive materials), as defined and described in the Minimum Requirements.

11. Any waste with a pH less than 6 or greater than 12.

12. Any waste which is difficult to analyse and classify.

13. Any complexes of heavy metal cations, paint and paint sludges, or laboratory chemicals.

14. Organic or inorganic element or compound which may have a definite acute or chronic negative effect on human health and/or the environment, due to its toxic, physical, chemical or persistent characteristics;

ANNEXURE II

INFORMATION WHICH SHALL BE SUBMITTED ON AN ANNUAL BASIS: CONDITION 9.1

* = *Indicate with an X. Please print legibly.*

NAME OF SITE: ____________________ DATE OF REPORT: ________ (yy/mm/dd)

1. Registered owner(s) of property on which disposal site is situated:

Name		Telephone	
Postal Address		Fax	
		Postal Code	

2. Operator in control of disposal site:

Name		Telephone	
Identity number		After hours	
Educational Qualifications (*)			

3. Indicate the type of waste and approximate quantities of waste disposed of during the year:

Type of waste	Quantity (m^3 $annum^{-1}$)	Compacted (C)	Uncompacted (U)
Household			
Garden refuse			
Building rubble			
Other (not hazardous) - Specify			
TOTAL			

4. Indicate the applicable waste types and quantities salvaged during the year (*)

Salvaging undertaken?		Yes	No		
Type	**Company sold/ given to**	**Quantity (m^3)**	**Type**	**Company sold/ given to**	**Quantity (m^3)**
Paper/wood fibre			Rubber		
Plastics			Textiles		
Glass			Iron		
Waste for composting			Food residues		

Other			Other		

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk Management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs	What is the overall magnitude of the risk? (Low-Medium - High)	On what did I I my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? This residual risk will be controlled by Compliance Assessment)
Local human population	Airbone dusts /particulars	Nuisance -dust on cars, clothing etc.	Deposition from air						
Local human population	Noise from machine	Nuisance loss of amenity, loss of sleep	Air transport						
Local human population	Fugitive releases, waste, litter and mud on roads	Nuisance loss of amenity.	Vehicles entering and leaving the Site. Waste escaping the Site						
Local human population	Odour	Nuisance loss of amenity.	Air transport						
Local human population	Scavenging birds and animals	Nuisance loss of amenity.	Air transport and over land						
	Pests (e.g flies)	Nuisance loss of amenity.	Air transport and over land						
Local human population	Flooding of Site	If waste is washed off site it may cause contamination	Flood waters						
Groundwater and surface waters	Fire on site leading to run-off from polluted fire fighting waters.	Contaminating of groundwater and aquatic ecosystems	Direct and indirect run-off						
Local human population and/or livestock gaining unauthorised access to the activities	All non-site hazards-particularly relating to waste handling & storage activity	People/ livestock coming into contact with hazards	Direct physical contact						
		Arson and/or vandalism causing the release of polluting	Arson-air Liquids polluting watercourses and/or						

		materials	groundwater						
Ground water	Contaminated run-off from waste	Contaminating of ground water	Soil to ground water to borehole.						
Local human population	Smoke from burning of waste in case of fire.	Nuisance, loss of amenity, loss of sleep. Respiratory irritation illness	Air transport						
EXPAND TABLE AS PER YOUR RISKS									

5. Comment on this application from SALT (South African Large Telescope)

From: Ramotholo Sefako [m ailto:rrs@saao.ac.za]
Sent: 18 December 2017 11:15 AM
To: Forster, Cleo
Subject: Re: Request for comment on a potential PV facility

Dear Cleo

Sorry that I was not able to reply to your em ail earlier. I don't think your PV facility will have effect on astronomy at the South African Astronomical Observatory and SALT near Sutherland in the Northern Cape. Your proposed facility is too far from us and well outside of the declared Sutherland Astronomical Advantage Areas for
Optical astronomy y. Your PV facility will not have any impact on SALT.

Regards
Ramotholo

From: Forster, Cleo
Sent: 04 December 2017 11:29 AM
To: 'rrs@saao.ac.za'
Subject: Request for comment on a potential PV facility

Dear Dr. Ramotholo Sefako,

I understand you have assisted juwi in the past with regard to a comment on the potential impact of renewable energy projects on SALT and I am hoping you will be able to do so again.

We are currently developing a potential multiphase PV development 40kms to the North- East of Kenhardt in the Northern Cape and although the study has been conducted on the impact on the SKA, with minimal impact anticipated, DEA has requested a comment from SALT on the possible impact. The project sits just within the astrological advantage area by our maps and I have attached a kmz of the location for your analysis.

Could you please let me know if you foresee any possible impact on the SALT from the development?

Many thanks,

Cleo Forster M.Arch (Sus Cities), B.Sc Eng
Project Development Manager * South Africa
Tel. +27. (0)21. 831 6117 * Mobile +27 (0) 79 892 7977 * Fax. +27. (0)21. 831 6199 *
cleo.forster@juwi.co.za<mailto:cleo.forster@juwi.co.za>

juwi Renewable Energies (Pty) Ltd * 24th Floor * Metropolitan Centre * 7 Walter Sisulu Avenue *
Foreshore * Cape Town * 8001 * South Africa * www.juwi.co.za<http://www.juwi.co.za/>

Managing Director: Greg Austin * Registration number: 2010/017943/07

6. Comment from SKA on the proposed Skeerhok PV 1, 2 and 3 Projects

Square Kilometre Array (SKA) SA

www.ska.ac.za

SKA AFRICA
SQUARE KILOMETRE ARRAY

Cleo Forster
Project Development Manager
Juwi Renewable Energy
Metropolitan Centre
7 Walter Sisulu Avenue
Cape Town
8001

Email: cleo.forster@juwi.co.za

6th February 2018

Dear Cleo,

Re: Development of Skeurhok PV Facility – Phase 1, 2 and 3

This letter is in response to your email request to provide an assessment on the potential development of the proposed Skeurhok PV Facility, to be established in three phases, and the risk it may pose on the Square Kilometre Array Project.

As input into this assessment, you have provided SKA South Africa (otherwise known as the South African Radio Astronomy Observatory) with detailed impact assessments, for each of the three phases, undertaken by an EMC consultant ITC Services. These assessment took into account a historical assessment that considered the cumulative impact of facilities proposed to be established at this same location, prepared by MESA Solutions.

An assessment of the detailed impact assessment has been conducted by SKA South Africa. This letter serves to confirm the outcomes of this assessment.

i. The detailed impact assessment includes a technology risk assessment, radio frequency measurements undertaken within a laboratory environment, and measurements undertaken at a representative photovoltaic facility (Dreunberg);
ii. The assessment for Skeurhok Phase 1 indicates that, based on the measurement data available and assuming up to six similar facilities in the vicinity are established, up to 20dB of attenuation will

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+27 (0)11 442 2454

Karoo Support Base
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Carnarvon, 8925
+27 (0) 21 506 7300

be required to ensure no interference with the SKA (should only one facility be established in the vicinity, this would reduce to 12 dB);

iii. The assessment for Skeurhok Phase 2 indicates that, based on the measurement data available and assuming up to six similar facilities in the vicinity are established, up to 40dB of attenuation will be required to ensure no interference with the SKA (should only one facility be established in the vicinity, this would reduce to 32 dB);

iv. The assessment for Skeurhok Phase 3 indicates that, based on the measurement data available and assuming up to six similar facilities in the vicinity are established, up to 35dB of attenuation will be required to ensure no interference with the SKA (should only one facility be established in the vicinity, this would reduce to 27 dB);

v. Based on the assessments for all three phases, the required attenuation as identified above would be applied, primarily, to the tracker systems that are identified in the technology risks;

vi. It is likely that additional risks may be identified during the detailed design process of the facilities, such as design decisions concerning specific suppliers of equipment. These risks may result in a different RFI risk profile that needs to be accommodated during the design and construction of the proposed facilities;

vii. SKA South Africa supports the view that the required attenuation is achievable following appropriate design decisions and implementation of mitigation measures. In order to ensure that the identified risk of interference is mitigated, SKA South Africa requires that, as a special condition to environmental authorisations that may be considered for any, or all, of the proposed facilities, Juwi Renewable Energy be required to prepare and submit an EMC (Electromagnetic Compatability) Control Plan to SKA South Africa for approval prior to any detailed design and construction activities associated with the proposed facilities. This EMC Control Plan shall prescribe the manner in which Juwi shall achieve the required protection, including appropriate acceptance testing and verification processes prior to any construction activities of the proposed facilities being initiated.

This technical advice is provided by the South African SKA Project Office on the basis of the protection requirements of the SKA in South Africa, and does not constitute legal approval of the renewable energy projects in terms of the Astronomy Geographic Advantage Act, the Management Authority, and its regulations or declarations.

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+27 (0) 21 506 7300

Regards,

Dr. Adrian Tiplady
Head: Strategy and Business Systems
SKA South Africa
Tel: 011 442 2434
Fax: 011 442 2454
atiplady@ska.ac.za

7. Title deed for Gemsbok Bult 120

Printed: 2016/06/23 14:42

windeed
information is our business

Deeds Office Property

GEMSBOK BULT, 120, 9 (REMAINING EXTENT) (CAPE TOWN)

GENERAL INFORMATION

Deeds Office	CAPE TOWN
Date Requested	2016/06/23 14:41
Information Source	DEEDS OFFICE
Reference	-

Authorised SearchInsure Approved

PROPERTY INFORMATION

Property Type	FARM
Farm Name	GEMSBOK BULT
Farm Number	120
Portion Number	9 (REMAINING EXTENT)
Local Authority	KENHARDT DC
Registration Division	KENHARDT RD
Province	NORTHERN CAPE
Diagram Deed	T4650/1939
Extent	2157.0307H
Previous Description	PTN OF 5-MERINO
LPI Code	C03600000000012000009

OWNER INFORMATION

Owner 1 of 1

Company Type	TRUST
Name	ERNESTUS CONNAN BELEGGINGSTRUST
Registration Number	418/2000
Title Deed	T25434/2004
Registration Date	2004/03/23
Purchase Price (R)	[redacted]
Purchase Date	2004/02/10
Share	
Microfilm Reference	2004 0348 4339
Multiple Properties	YES
Multiple Owners	NO

ENDORSEMENTS (6)

#	Document	Institution	Amount (R)	Microfilm
1	BC45642/1991	MINISTERS TOESTEMMING	UNKNOWN	1991 1358 0246
2	K1117/2010S	-	UNKNOWN	
3	K274/1977RM	-	UNKNOWN	
4	K275/1977RM	DONALD CONNAN FAMILIE TRUST	UNKNOWN	
5	K462/2016S	-	UNKNOWN	
6	FARM KE 120/9	-	UNKNOWN	1985 0041 1247

HISTORIC DOCUMENTS (3)

#	Document	Owner	Amount (R)	Microfilm
1	B55372/1991	LANDBANK	UNKNOWN	2000 0049 3843
2	B49114/1999	-	UNKNOWN	2004 0348 4366
3	T14641/1979	CONNAN ERNESTUS	UNKNOWN	2004 0348 4376

DISCLAIMER

8. Description of the mitigation and management measures relating to battery storage

Although unlikely to occur, the operation of a battery storage on site does pose risks. The main risks and their possible sources are shown in Figure 1 and discussed Table 1 below. The table indicates the risks associated with the battery storage facility, the design measures and/or management measures to be implemented and a reference to the relevant section in the EMPr where these measures have been included. With the implementation of these management measures, the likelihood of the risks occurring is considered to be low.

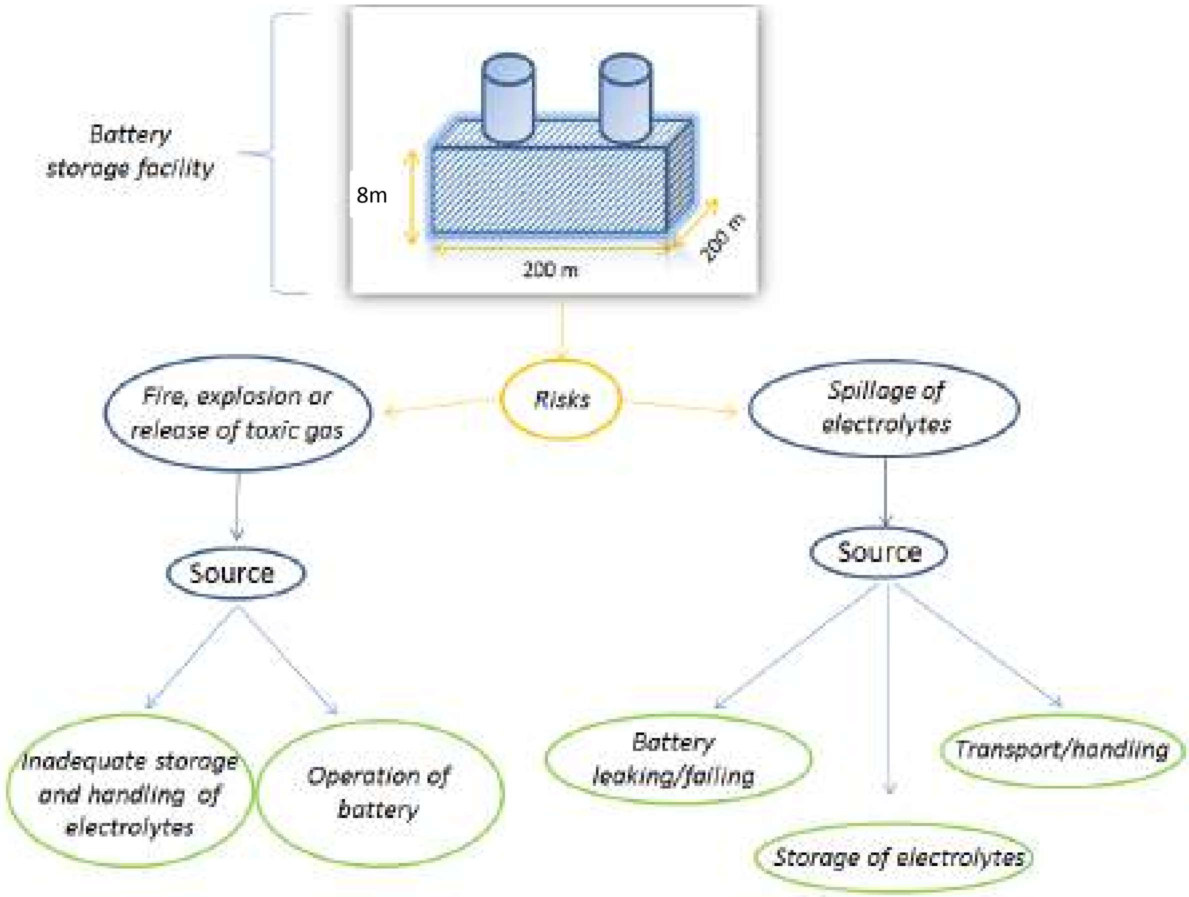

Figure 1: Environmental risks associated with the battery storage facility

Table 1: Mitigations summary for the Battery Storage Facility

Risk Source	Actions included in the design or additional measures determined as part of the EIA to manage risk	Reference in the draft EMPr where management measure is included
Spillage of electrolyte	**Design measures**	
	Adhere to the appropriate international standards and South African National Standards (SANS) requirements	**Section 10.3** (Section 10: Hazardous substances leakage or spillage monitoring system)
	Place battery on an impermeable barrier/layer (e.g. concrete surface with acid lining)	
	A secondary containment must be constructed with a capacity of at least 110% of the largest storage tank's capacity and the off-loading point must be located in the bunded area to ensure that any potential spill during the off-loading of the electrolyte solutions is contained	
	Additional measures	
	• The transport vehicle should be identified with symbols • Drivers and auxiliaries should be trained • Personal protection equipment should be provided • Used batteries must be transported inside containers and the containers must be well packed to the transport vehicle • A minimum set of equipment necessary to combat any simple spillage or leakage problems should be provided and the transport team trained on how to use it;	**Section 7.7** (Section 7: Traffic management plan including transportation plan) **Section 10.3** (Section 10: Hazardous substances leakage or spillage monitoring system)

	• Divert rainwater away from the bunded area to avoid rainwater mixing with electrolyte spillage potentially present within the secondary containment • Ensure that the containment area is sloped to a sump • All drains should be covered.	**Section 10.3** (Section 10: Hazardous substances leakage or spillage monitoring system)
	• Any spill/leakage from the battery storage facility must be attended to immediately and be handled in an environmental friendly manner (i.e. no discharge into the ground or any surface water body) and must be disposed of at an appropriate licensed hazardous waste disposal facility. • In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree of contamination, excavation and removal to a hazardous waste disposal site might be necessary. If the spillage is widespread, a specialist will need to be immediately appointed to deal with the issue, the DEA notified and the notification process stipulated in the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 331, 2 May 2014) should be followed.	**Section 10.3 and Section 10.4** (Section 10: Hazardous substances leakage or spillage monitoring system)
Fire, explosion or release of toxic gas	**Design measures**	
	• Construct facility according to the supplier's design specifications • Adhere to the appropriate international standards and SANS requirements	**Section 11.2** (Section 11: Hazardous substances leakage or spillage monitoring system)
	Additional measures	

	• Should electrolyte solutions be stored on site, these should be stored away from incompatible materials such as all peroxides, such as hydrogen peroxide; chemicals that react with acid to generate a gaseous product, such as carbonate and bicarbonates, sulfites and bisulfites; strong reducing agents, such as alkaline metals (Li, Na, K) and alkaline earth metals (Be Mg Ca, Sr, Ba); reactive metals such as aluminum and zinc, all hydrides (such as $LiAlH_4$, $NaBH_4$), and some carbides (such as CaC_2). • The batteries should be placed in a well-ventilated area, include vents (where necessary and applicable).	**Section 11.14 and 11.2** (Section 11: Environmental awareness and fire management plan)

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

APPENDIX P:

SKA RFI Study

Interference Testing and Consultancy Services (Pty) Ltd

ITC SERVICES (PTY) LTD Reg 88/02032/07
Plot 44 Kameeldrift East, Pretoria
Private Bag X13 Lynn East 0039
Republic of South Africa
Tel (012) 808 1730 Int + 27 12 808 1730
Fax (012) 808 1733

REPORT ADDRESSING ELECTOMAGNETIC INTERFERENCE (EMI) FOR SKEURHOK PV PHASE TWO.

DOCUMENT NUMBER	**:**	**R 7373/17**
REVISION	**:**	**1.0**
DATE	**:**	**05 December 2017**
MASTER	**:**	**MASTER**

CONFIGURATION CONTROL

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JUWI (PTY) LTD Client			
ITC SERVICES Prepared By	C Fouché		08/12/2017
ITC SERVICES Reviewed By	SM Gough		08/12/2017

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LIST OF EFFECTIVE PAGES								CONFIGURATION CONTROL
PAGE	**REV**	**PAGE**	**REV**	**PAGE**	**REV**	**PAGE**	**REV**	
i	1.0	16	1.0					
ii	1.0	17	1.0					
iii	1.0	18	1.0					
iv	1.0	19	1.0					
1	1.0	20	1.0					
2	1.0	21	1.0					
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14	1.0							
15	1.0							

ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
AM	Amplitude Modulation
CAL	Calibration
CCW	Counter Clockwise
CM	Common Mode
E-Fields	Electric Fields
EM	Electro Magnetic
EMPr	Environmental Management Programme
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
Eq	Equation
EUT	Equipment Under Test
Fr	Resonant frequency
H- Fields	Magnetic Fields
IEEE	Institute of Electrical and Electronic Engineers
ITM	Irregular Terrain Model
ITU	International Telecommunications Union
MIL-STD	Military Standard
PSU	Power Supply Unit
R&S	Rohde and Schwarz
RF	Radio Frequency
SE	Shielding Effectiveness
SELDS	Shielded Enclosure Leak Detection System
SKA	Square Kilometre Array

TABLE OF CONTENTS

1. INTRODUCTION

The proposed project area of the Skeurhok Photovoltaic (PV) Phase 2 project (there are three possible phases of 75MWac each) falls within the Astronomical Advantage Area of the SKA. In order to determine whether the proposed facilities could have any influence on the SKA, Juwi Renewable Energies (Pty) Ltd requested an initial risk evaluation of the proposed development to SKA activities. The frequency band of concern for SKA is 70MHz to 20GHz.

While it is committed for all internal communication to be in the form of fibre optic cabling, which will result in negligible emissions, it is also assumed that other external telecommunication services or networks that will potentially be established as part of the facility will be compliant with SKA requirements, and the emissions from such infrastructure has thus not been assessed in detail as part of this report. The requirement for compliant telecommunication infrastructure has, however, been included in the EMC Plan requirements.

1.1 REFERENCED AND APPLICABLE DOCUMENTS

[1] Regulations on Radio Astronomy Protection Levels in Astronomy Advantage Areas Declared for the Purposes of Radio Astronomy No.R 90. Government Gazette 10 February 2012 (35007).
[2] K0000-2001V1-02 R: SKA Standard for calculating RFI Threshold Levels – RT Lord 8 December 2010.
[3] CISPR 11: Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement.
[4] NTIA Report 82-100: A guide to the use of the ITS Irregular Terrain Model in the Area Prediction Mode
[5] EMC test report 110092-AU01+E01 – EMV TESTHAUS GmbH (Tracker test report)
[6] Electromagnetic Compatibility EMC Test Report 285952-1-2 – SGS Fimko Ltd (Inverter Test Report)
[7] NTIA TM-89-139 Single and Aggregate Emission Level Models for Interference Analysis
[8] SCA/16/01/29 - Cumulative Topographical Analysis of Proposed PV Projects in AGA Area MESA Solutions (Pty) Ltd

2. METHODOLOGY

This phase of assessment is based on laboratory tested radio frequency emissions to determine technology risks (power conversion, trackers control systems, etc.) of the renewable energy system and the measurements at a representative site (Dreunberg) as reported in [8]. A second phase of post-construction in-field measurements will be necessary to confirm results of this study or provide further input.

The proposed site of the renewable energy installation is plotted with reference to the MeerKAT, SKA Phase 1 and SKA Phase 2 telescope locations. The worst case point-to-point links are then identified using the SPLAT! RF propagation tool, i.e. the cases with the lowest total path loss between the proposed Skeurhok Phase1 stations and each of the three SKA phases. SARAS receiver protection levels against expected received amplitudes from the renewable power technology are determined and the required mitigation calculated. The CISPR11 Class A emission standards [3] are also provided as reference.

The expected loss as determined by the Irregular Terrain Model [4] (Longley Rice model applicable for frequencies between 20MHz and 20GHz) between the proposed site and nearest SKA stations is presented in Graph 1 to Graph 3. The reduction in power density of an electromagnetic wave as it propagates is a function of free-space loss (natural expansion of the wave front in free space (i.e. distance between source and receiver), diffraction loss (part of the wave front is obstructed by an obstacle, in this case terrain such as a hill), vegetation and foliage (environment) and the propagation medium (dry/ moist air in this case) to name a few.

Actual laboratory measured data are presented to confirm the source amplitude of the various components utilised in the Skeurhok design. Measurements made at Dreunberg, a representative facility has been compared to the laboratory data and was found to be of comparable amplitudes. The transient data of the Dreunberg facility is up to 20dB higher than the laboratory data.

Although reference is made to CISPR 11 and CISPR 22 in this document, it should be noted that the quasi-peak detector used for CISPR tests will result in low amplitudes being recorded for signals with a low pulse repetition rate. Due to the number of potential sources on the plant (120 inverters and 1093 tracker systems) and the characteristics of a radio telescope, peak detection (max hold function) has been used when evaluating impulse signals with low repetition rates.

This report is one of three to be used to evaluate possible Skeurhok PV phases with manageable impact on the SKA and to rank the phases in terms of potential impact on the SKA, therefore each phase is assessed independently.

3. TECHNOLOGY DESCRIPTION (SKEURHOK SOLAR ENERGY FACILITY)

Photovoltaic (PV) panels convert the energy delivered by the sun to direct current (DC) electric energy. The array of PV modules is connected to an inverter by means of a network of cables. The DC current is converted to alternating current (AC) power by a grid-tied inverter. The AC power can then be added to the national electricity network (grid). The voltage at which power is generated is stepped up to the required voltage of the point of connection to the national grid by using a transformer. The electricity is distributed from the on-site transformers (substation) via overhead power lines into the national grid. The infrastructure of the facility includes the ground-mounted structures, solar PV modules, cables, inverter rooms, access roads, auxiliary roads, an on-site substation, and a distribution line. The primary input of the system is sunlight, which is converted to electricity. The sun tracker technology utilizes auxiliary electricity from the national grid to power tracker motors in order to optimize the amount of sunlight on the solar PV infrastructure. In addition to auxiliary power being used for powering tracker motors, small amounts of auxiliary power would be used for on-site usage on items such as, but not limited to, security and site office energy requirements. The tracking system is ground-mounted and follows the sun's path with the use of dual-axis technology in order to maximize the amount of direct sunlight on the Solar PV modules.
Main industrial equipment in the PV plant used for this assessment is the following:

- Photovoltaic generator/module Model BYD 340P6D-36
- Insta Net DC combiner boxes E100-443
- Ideematec safeTrack HorizonPV tracker system
- ABB Inverters model PVS980-58-2000KVA
- Substation (transformer + MV cubicles)

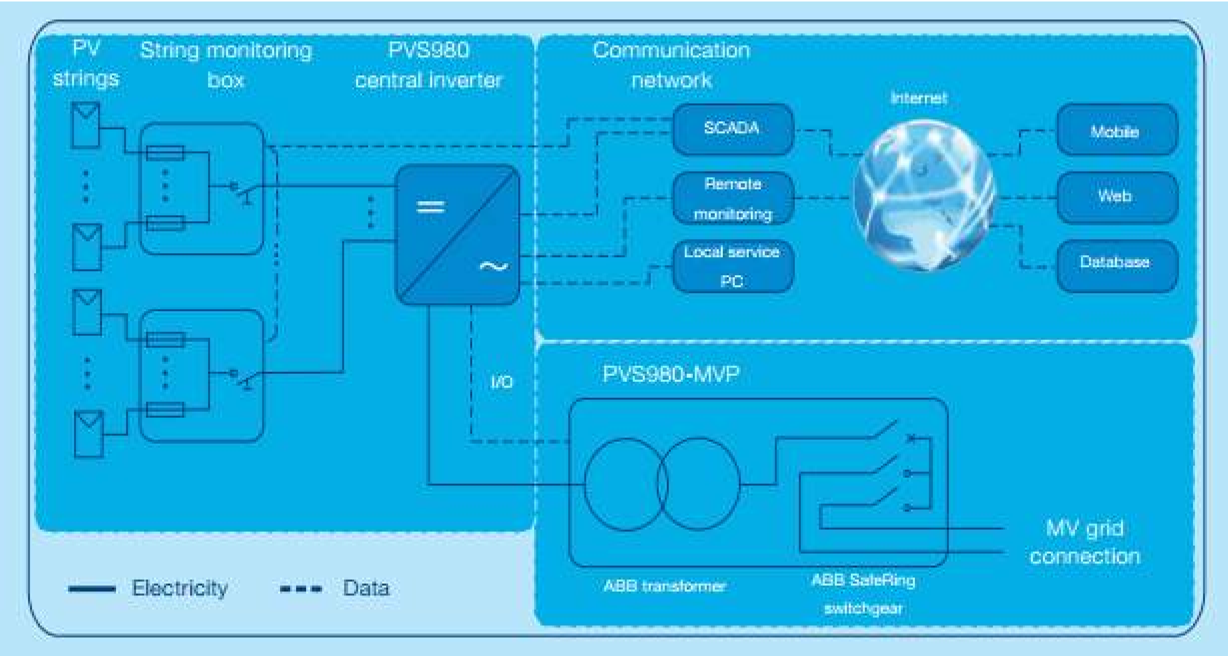


Figure 1: ABB System block diagram

4. RISK IDENTIFICATION

4.1 TECHNOLOGY RISKS

The following building blocks are viewed as potential interference sources:

- PV tracker system
- DC combiner boxes
- Inverters (AC as well as DC path)
- PV Generator control and management
- Control and operations centre (computer equipment)

4.1.1 PV Tracker and DC Combiner System

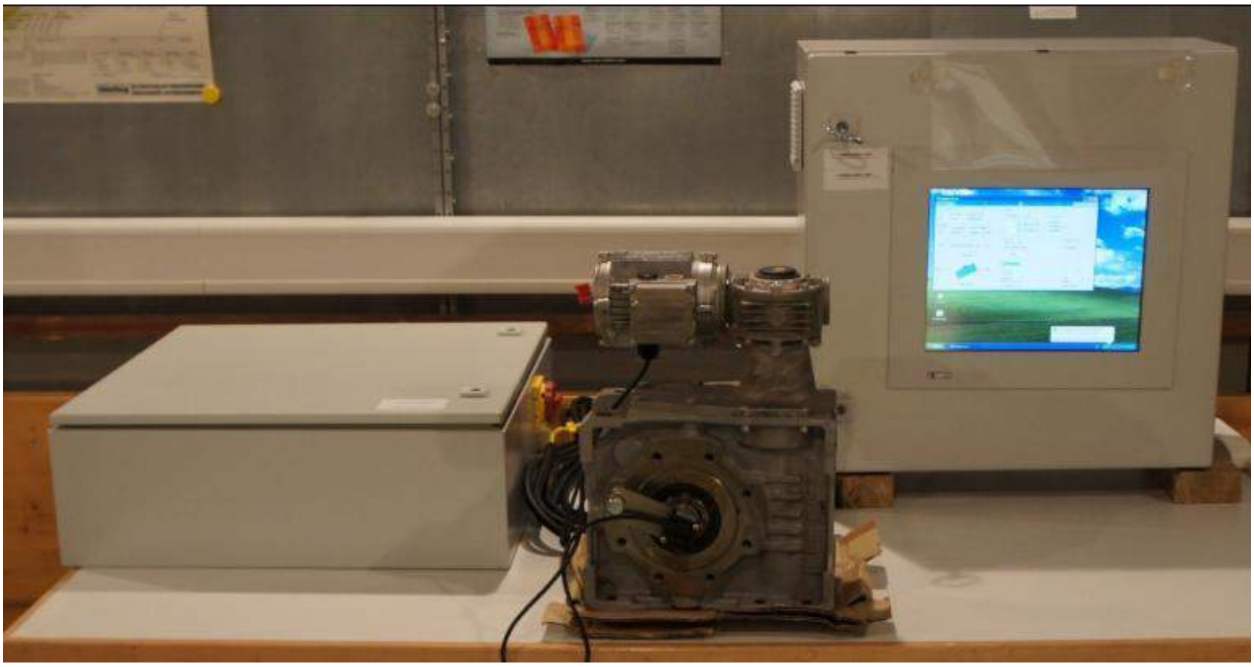


Figure 2: Tracker and DC combiner test set-up

The tracker system and DC combiner system was tested as a system [5] as shown in Figure 2 and complies to CISPR 22 Class B.

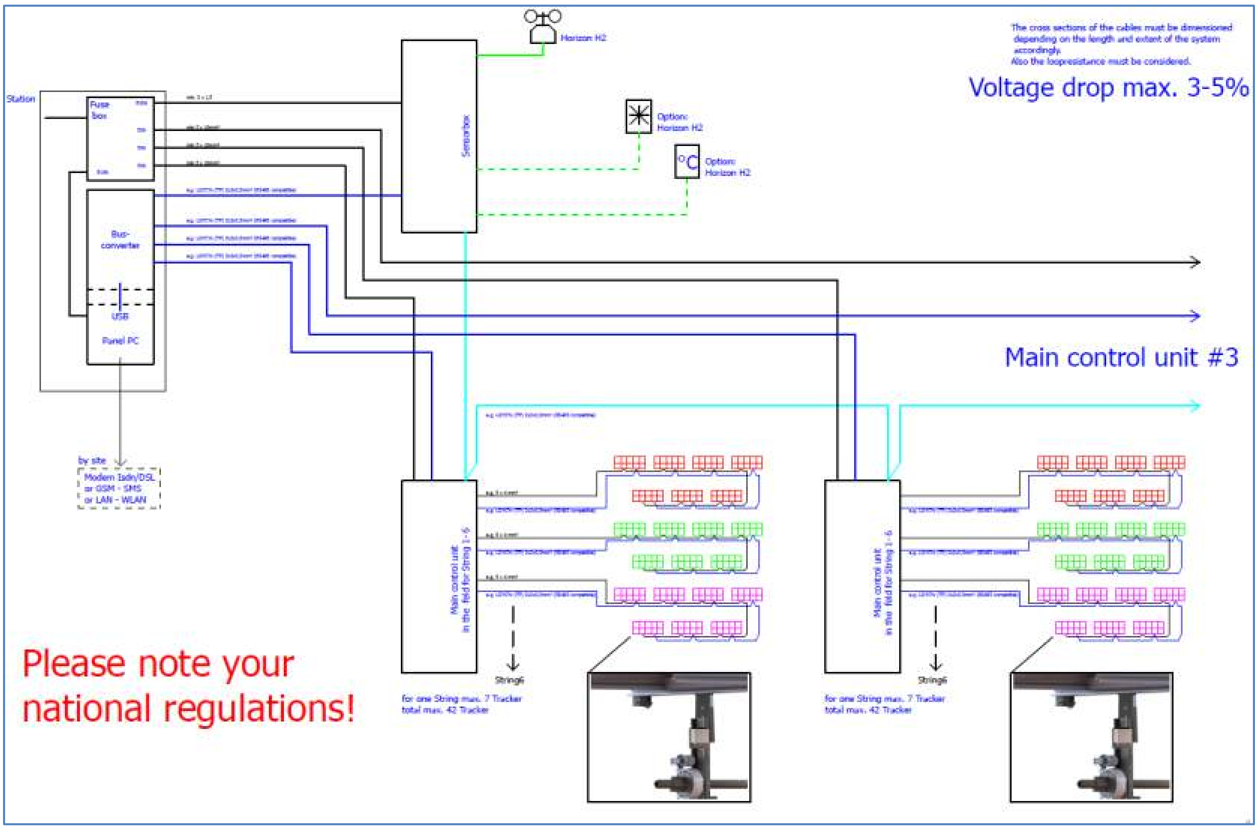


Figure 3: Tracker Single line diagram

4.1.2 Inverter

Figure 4: Inverter test set-up

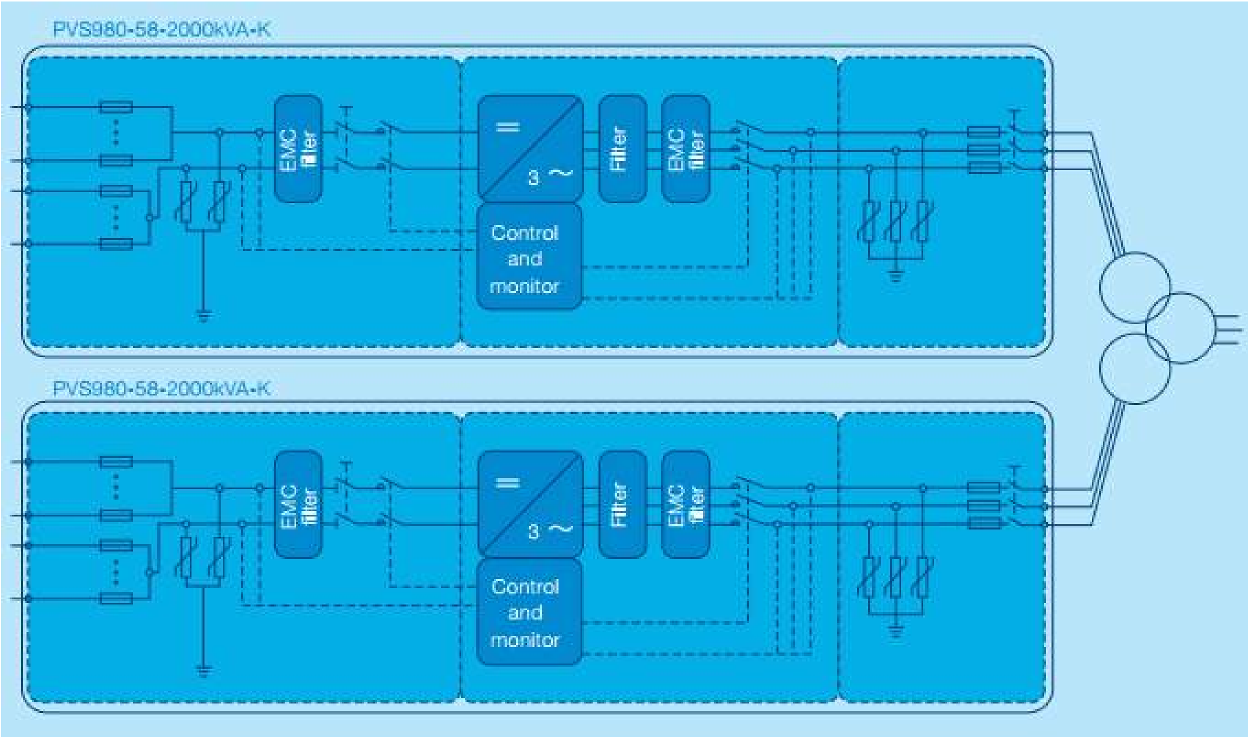


Figure 5: Inverter block diagram

The inverter system was tested as a complete system [6] as shown in Figure 4 and complies with CISPR 22 Class A (40dBuV/m @10m < 230MHz and 47dBuV/m @10m 230MHz to 1GHz) at frequencies above 80MHz. Worth noting is that the ABB inverter has EMC filtering on both the DC input and AC output side.

4.1.3 PV Generator control and management

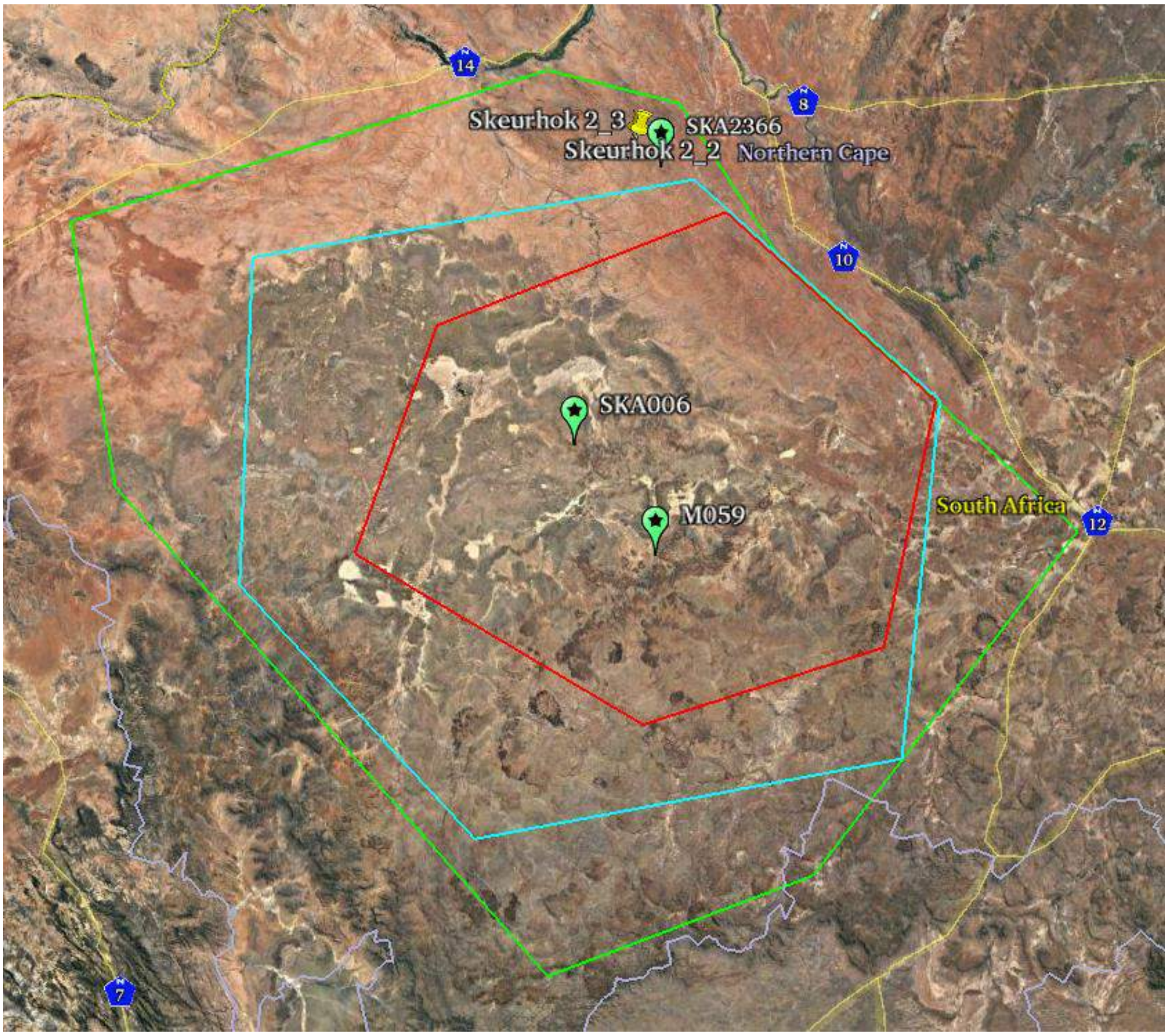
All communication infrastructure to enable the transfer of information between the various elements connected to the network, such as the local office of the SCADA and PLCs will be connected via optical fibre (as per Par 10 of Design Summary sheet attached as Appendix C refers). The RFI emissions from such fibre optic infrastructure are negligible.

4.1.4 Cumulative emissions

A large number of non-correlated noise sources (inverters, PV panel controls etc.) could increase the noise floor at a receiving site distant from the noise sources. Due to the relatively high source density, the accepted approximation on $10 \times logN$ where N is the total number of noise sources was used to estimate the cumulative impact.

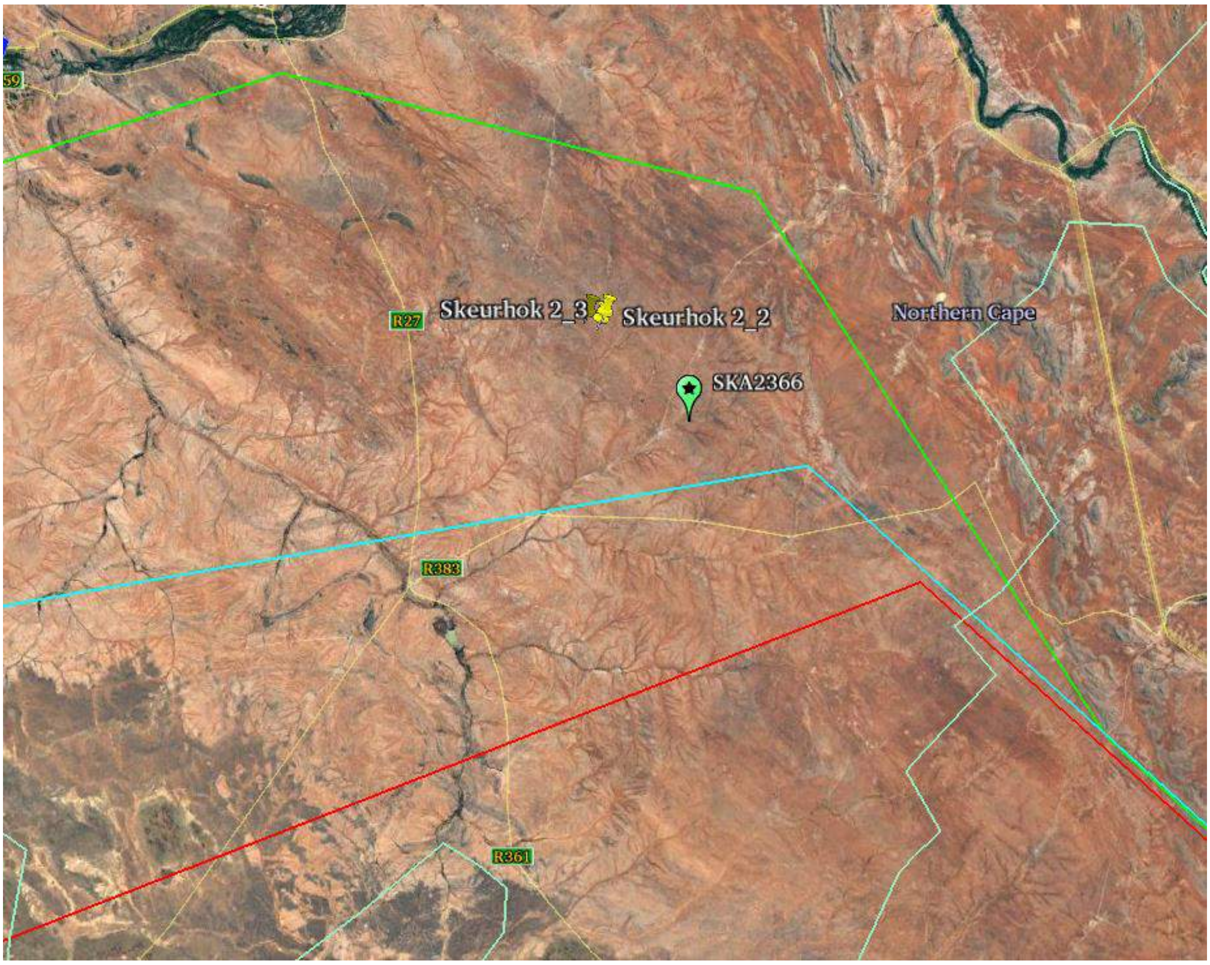
4.2 SITE LOCATION

4.2.1 Area Map



Picture 1: Area Map showing Skeurhok Phase 2 locations and SKA KCAAA as well as the worst effected SKA dishes in terms of MeerKAT, SKA Phase1 and SKA Phase2

4.2.2 Local Map



Picture 2: Local map showing closest SKA station (SKA Phase 2)

4.2.3 Elevation Maps

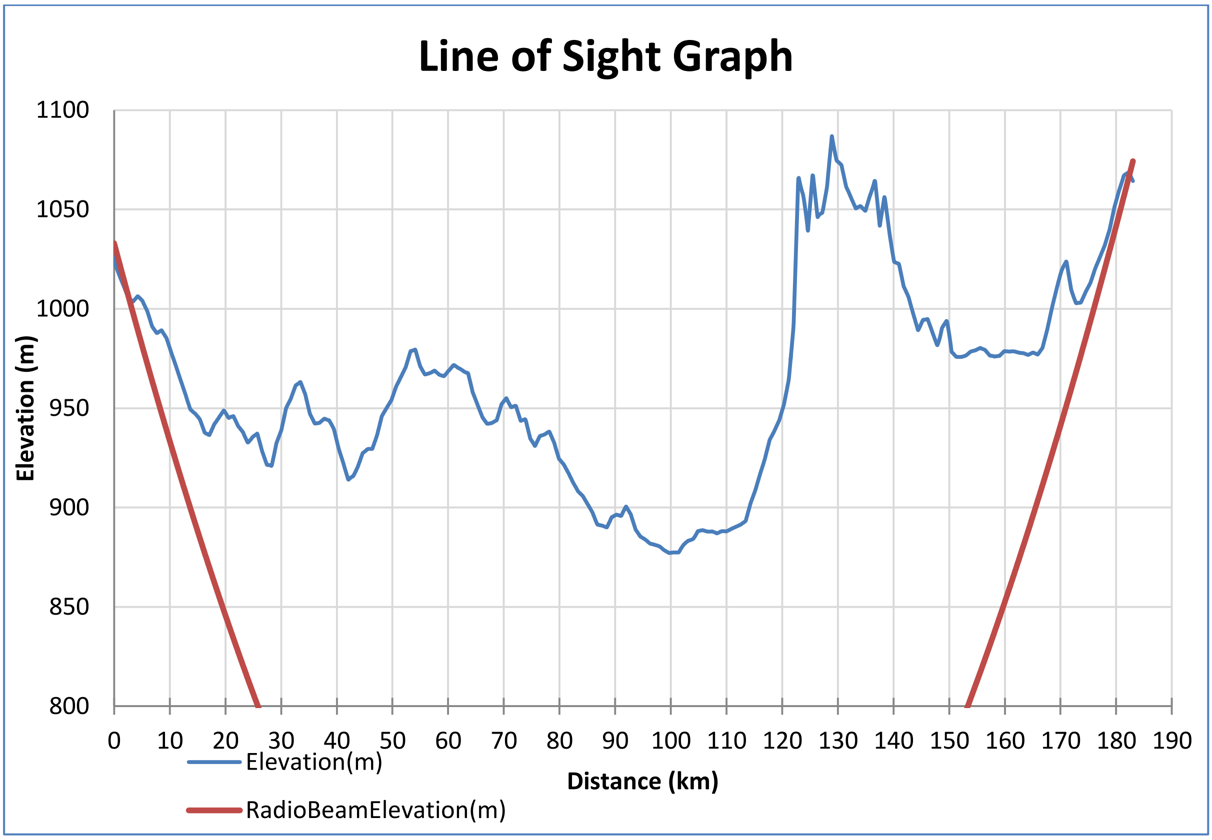


Figure 6: Skeurhok 2_2 to MeerKAT ID M059

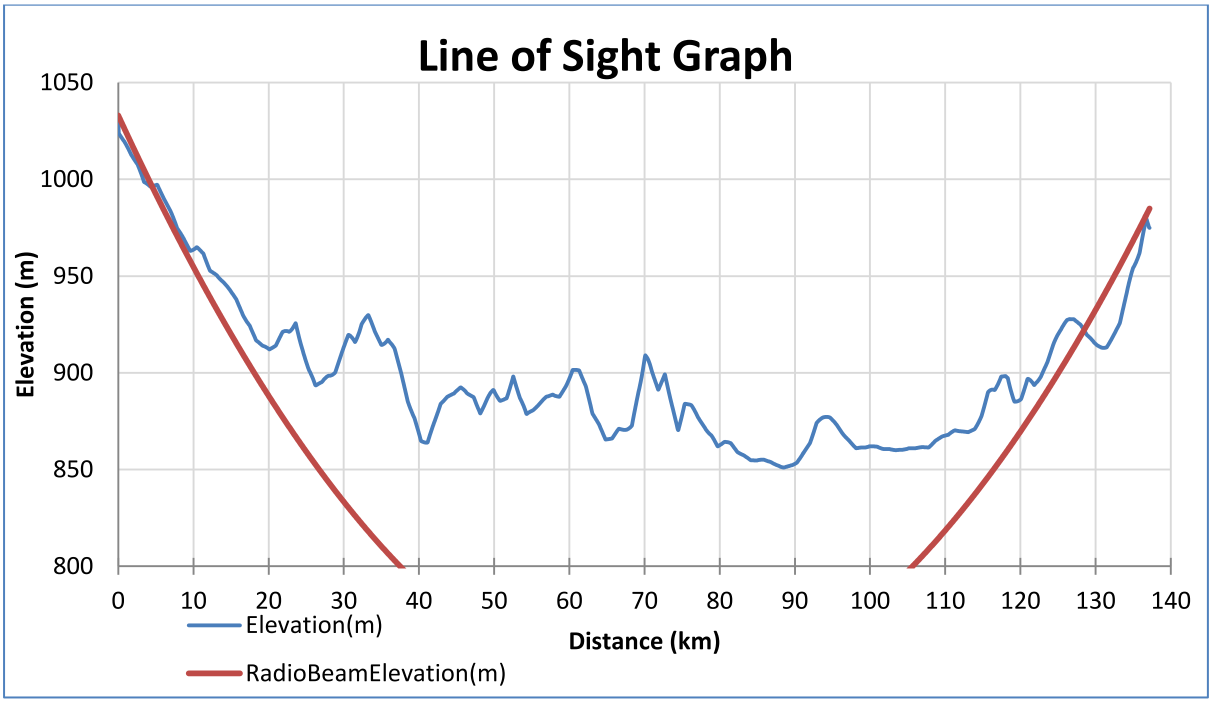


Figure 7: Skeurhok 2_2 to SKA ID 006

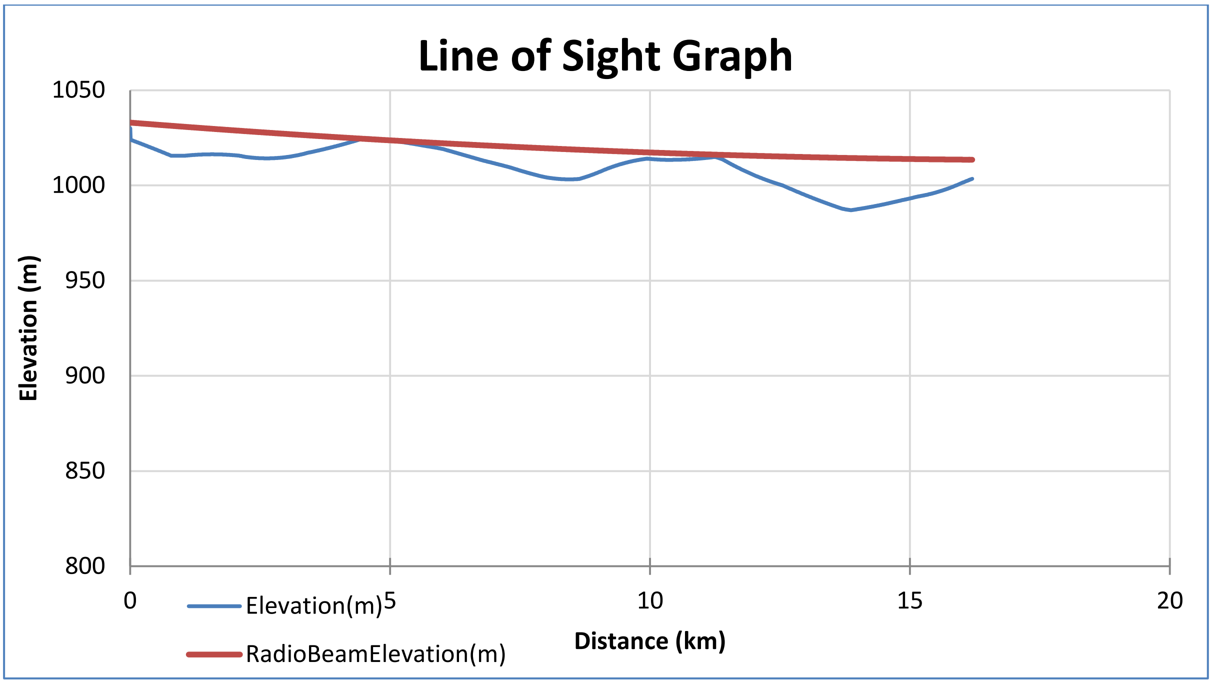


Figure 8: Skeurhok 2_2 to SKA ID 2366

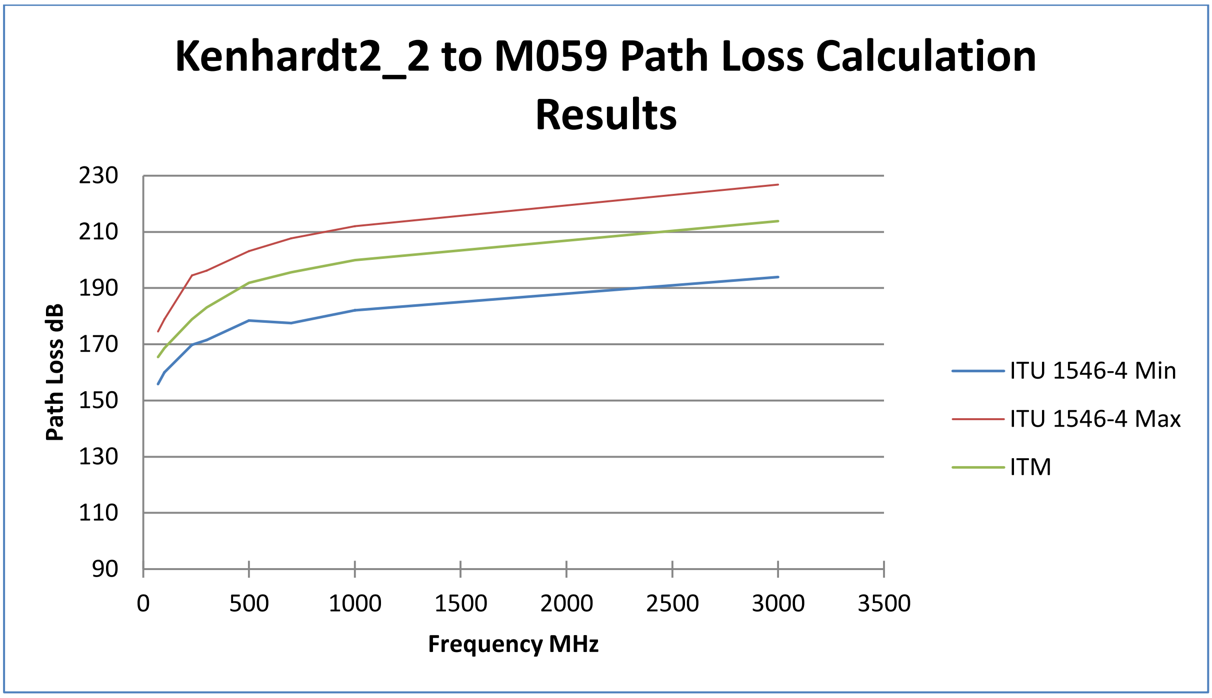
4.3 INPUT DATA

Parameter	Description	Quantity	Comment
Source/ Victim separation distance	Skeurhok2_2 to M059 Skeurhok2_2 to SKA006 Skeurhok2_2 to SKA2366	182.24 km 137.05 km 16.14 km	No direct line of sight conditions
Frequency	Frequencies (MHz) assessed for: Trackers Inverter	100; 230; 300; 500; 700; 1000 100; 230; 300; 500; 700; 1000; 3000; 6000	Free space loss increases with frequency. The assessed frequencies are in the ranges where the risk for SKA interference is anticipated to be the greatest, and the results in these ranges are assumed to be representative of risk in the SKA ranges of interest from 70MHz to 20GHz.
TX Power	Measured data (EN CISPR 11 Class A >20kVA @ 10m) Measured data SCATEC	50 dBµV/m for <100MHz 35 dBµV/m for >100MHz 35 dBµV/m	Based on the measured inverter data [6] Inverter (Par 2.7.2 SCA/16/01/29/REV1
SARAS	Protection level	dBm/Hz = -17.2708 log 10 (f) -192.0714 for f<2GHz	Government Gazette 10 February 2012
RX height	All SKA receivers	10m	Height used for SKA receive horn

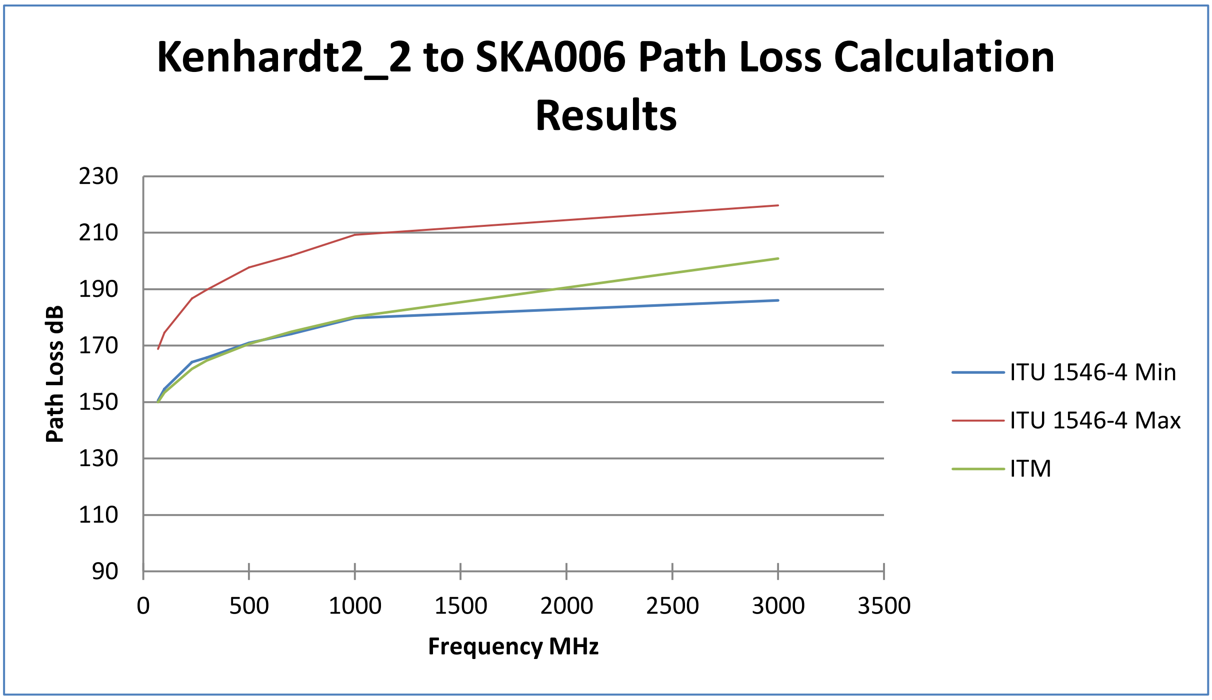
Table 1: Input data for path loss calculations

4.4 PATH LOSS CALCULATIONS (ITU-R P.1546-4 AND ITM)

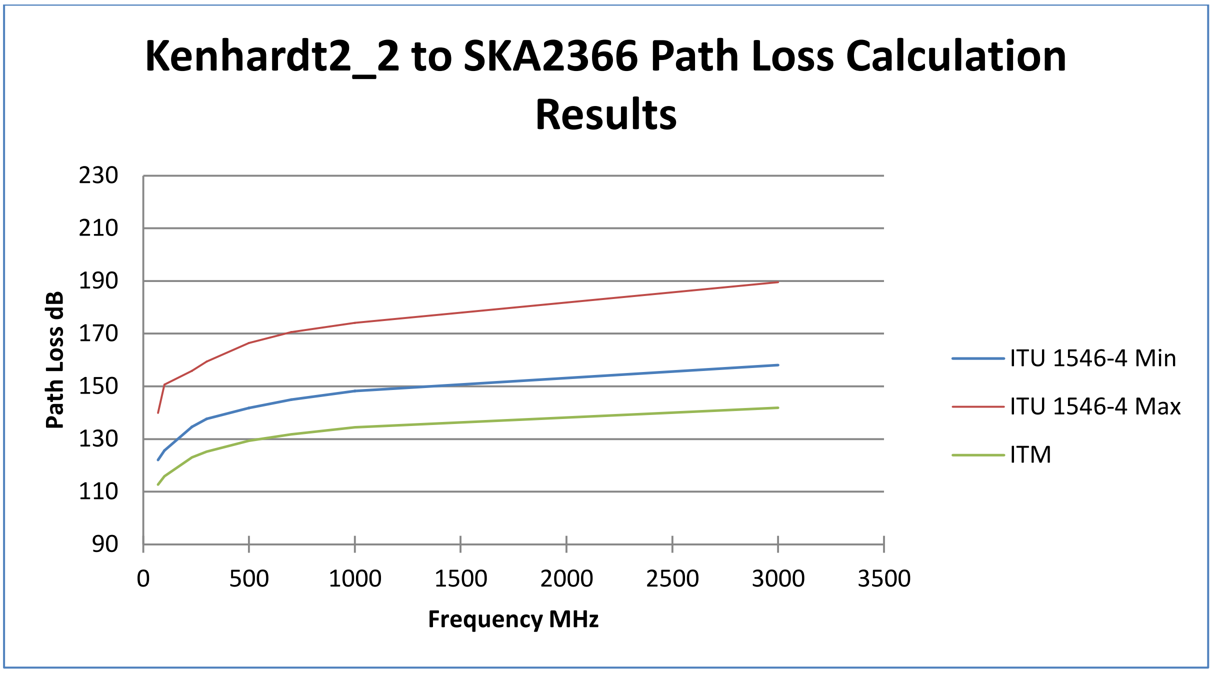
The path loss was calculated using the parameters as specified in Table 1 and transmit and receive heights of 3m and 10m, respectively.



Graph 1:Skeurhok2_2 to M059 Path Loss Calculation Results



Graph 2: Skeurhok2_2 to SKA006 Path Loss Calculation Results



Graph 3: Skeurhok2_2 to SKA2366 Path Loss Calculation Results

Graph 1 to Graph 3 show the expected path loss as determined by the Irregular Terrain Model (Longley Rice model applicable for frequencies between 20MHz and 20GHz) and the minimum and maximum values of the ITU-R P.1546-4 Land Path propagation model statistical simulation based on the Monte-Carlo method. The ITU-R P.1546-4 Land Path propagation model does not apply site specific terrain data.

The reduction in power density of an electromagnetic wave as it propagates is a function of free-space loss (natural expansion of the wave front in free space i.e. distance between source and receiver), diffraction loss (part of the wave front is obstructed by an obstacle, in this case terrain such as a hill), vegetation and foliage (environment) and the propagation medium (dry/ moist air in this case) to name a few.

The distance of 16.14 km from Skeurhok 2_2 to SKA ID 2366 is the shortest with the lowest path loss result.

5. POTENTIAL IMPACT AND MITIGATION REQUIREMENTS

Measured data at Dreunberg is 15dB to 25dB less than the laboratory results shown in Appendix A and B.

1.1 IMPACT ON MEERKAT BASED ON THE SCATEC INVERTER DATA

Worst case impact on MeerKAT will be from the Skeurhok 2_2 waypoint to M059.

Skeurhok2_2 to M059 @ 182.24km							
Frequency [MHz]	SCATEC Data P[dBW]	Saras [dBW/Hz]	Required path loss [dB]	Path Loss (Measured or calculated) [dB]	Number of inverter units in facility	Mitigation required for facility [dB]	Mitigation required per unit [dB]
70	*-79.80*	-253.94	123.35	165.40	120	-42.05	-21.26
100	*-79.80*	-256.61	126.02	168.60	120	-42.58	-21.79
230	*-79.80*	-262.86	132.27	178.90	120	-46.63	-25.84
300	*-79.80*	-264.85	134.26	183.10	120	-48.84	-28.05
500	*-79.80*	-268.68	138.09	191.80	120	-53.71	-32.92
700	*-79.80*	-271.21	140.62	195.60	120	-59.28	-38.49
1000	*-79.80*	-273.88	143.29	199.90	120	-70.51	-49.72
3000	*-90.26*	-279.09	128.84	213.80	120	-84.96	-64.17
6000	*-90.26*	-279.11	128.86	222.70	120	-93.84	-73.05

Table 2: MeerKAT impact and mitigation requirement

1.2 IMPACT ON SKA PHASE 1 BASED ON THE SCATEC INVERTER DATA

Worst case impact on SKA Phase 1 will be from the Skeurhok 2_2 waypoint to SKA 006.

Skeurhok2_2 to SKA006 @ 137.05km							
Frequency [MHz]	SCATEC Data P[dBW]	Saras [dBW/Hz]	Required path loss [dB]	Path Loss (Measured or calculated) [dB]	Number of inverter units in facility	Mitigation required for facility [dB]	Mitigation required per unit [dB]
70	*-79.80*	-253.94	123.35	150.00	120	-26.65	-5.86
100	*-79.80*	-256.61	126.02	153.40	120	-27.38	-6.59
230	*-79.80*	-262.86	132.27	161.80	120	-29.53	-8.74
300	*-79.80*	-264.85	134.26	164.70	120	-30.44	-9.65
500	*-79.80*	-268.68	138.09	170.60	120	-32.51	-11.72
700	*-79.80*	-271.21	140.62	174.90	120	-39.58	-18.79
1000	*-79.80*	-273.88	143.29	180.20	120	-57.61	-36.82
3000	*-90.26*	-279.09	128.84	200.90	120	-72.06	-51.27
6000	*-90.26*	-279.11	128.86	216.10	120	-87.24	-66.45

Table 3: SKA Phase 1 impact and mitigation requirement

1.3 IMPACT ON SKA PHASE 2 BASED ON THE SCATEC INVERTER DATA

Worst case impact on SKA Phase 2 will be from the Skeurhok 2_2 waypoint to SKA 2366.

Skeurhok2_2 to SKA2366 @ 16.14km							
Frequency [MHz]	SCATEC Data P[dBW]	Saras [dBW/Hz]	Required path loss [dB]	Path Loss (Measured or calculated) [dB]	Number of inverter units in facility	Mitigation required for facility [dB]	Mitigation required per unit [dB]
70	*-79.80*	-253.94	123.35	112.70	120	10.65	31.44
100	*-79.80*	-256.61	126.02	115.90	120	10.12	30.91
230	*-79.80*	-262.86	132.27	123.00	120	9.27	30.06
300	*-79.80*	-264.85	134.26	125.20	120	9.06	29.85
500	*-79.80*	-268.68	138.09	129.30	120	8.79	29.58
700	*-79.80*	-271.21	140.62	131.80	120	6.12	26.91
1000	*-79.80*	-273.88	143.29	134.50	120	1.39	22.18
3000	*-90.26*	-279.09	128.84	141.90	120	-13.06	7.73
6000	*-90.26*	-279.11	128.86	146.00	120	-17.14	3.65

Table 4: SKA Phase 2 impact and mitigation requirement

1.4 IMPACT ON MEERKAT BASED ON THE SCATEC TRACKER DATA

Worst case impact on MeerKAT will be from the Skeurhok2_2 waypoint to M059.

Skeurhok2_2 to M059 @ 182.24km							
Frequency [MHz]	SCATEC Data P[dBW]	Saras [dBW/Hz]	Required path loss [dB]	Path Loss (Measured or calculated) [dB]	Number of tracker units in facility	Mitigation required for facility [dB]	Mitigation required per unit [dB]
70	*-89.80*	-253.94	113.35	165.40	1093	-52.05	-21.67
100	*-89.80*	-256.61	116.02	168.60	1093	-52.58	-22.19
230	*-89.80*	-262.86	122.27	178.90	1093	-56.63	-26.25
300	*-89.80*	-264.85	124.26	183.10	1093	-58.84	-28.45
500	*-89.80*	-268.68	128.09	191.80	1093	-63.71	-33.32
700	*-89.80*	-271.21	130.62	195.60	1093	-69.28	-38.90
1000	*-89.80*	-273.88	133.29	199.90	1093	-80.51	-50.12
3000	*-100.26*	-279.09	118.84	213.80	1093	-94.96	-64.58
6000	*-100.26*	-279.11	118.86	222.70	1093	-103.84	-73.46

Table 5: MeerKAT impact and mitigation requirement

1.5 IMPACT ON SKA PHASE 1 BASED ON THE SCATEC TRACKER DATA

Worst case impact on SKA Phase 1 will be from the Skeurhok 2_2 waypoint to SKA 006.

Skeurhok2_2 to SKA006 @ 137.05km							
Frequency [MHz]	SCATEC Data P[dBW]	Saras [dBW/Hz]	Required path loss [dB]	Path Loss (Measured or calculated) [dB]	Number of tracker units in facility	Mitigation required for facility [dB]	Mitigation required per unit [dB]
70	*-89.80*	-253.94	113.35	150.00	1093	-36.65	-6.27
100	*-89.80*	-256.61	116.02	153.40	1093	-37.38	-6.99
230	*-89.80*	-262.86	122.27	161.80	1093	-39.53	-9.15
300	*-89.80*	-264.85	124.26	164.70	1093	-40.44	-10.05
500	*-89.80*	-268.68	128.09	170.60	1093	-42.51	-12.12
700	*-89.80*	-271.21	130.62	174.90	1093	-49.58	-19.20
1000	*-89.80*	-273.88	133.29	180.20	1093	-67.61	-37.22
3000	*-100.26*	-279.09	118.84	200.90	1093	-82.06	-51.68
6000	*-100.26*	-279.11	118.86	216.10	1093	-97.24	-66.86

Table 6: SKA Phase 1 impact and mitigation requirement

1.6 IMPACT ON SKA PHASE 2 BASED ON THE SCATEC TRACKER DATA

Worst case impact on SKA Phase 2 will be from the Skeurhok2_2 waypoint to SKA 2366.

Skeurhok2_2 to SKA2366 @ 16.14km							
Frequency [MHz]	SCATEC Data P[dBW]	Saras [dBW/Hz]	Required path loss [dB]	Path Loss (Measured or calculated) [dB]	Number of tracker units in facility	Mitigation required for facility [dB]	Mitigation required per unit [dB]
70	*-89.80*	-253.94	113.35	112.70	1093	0.65	31.03
100	*-89.80*	-256.61	116.02	115.90	1093	0.12	30.51
230	*-89.80*	-262.86	122.27	123.00	1093	-0.73	29.65
300	*-89.80*	-264.85	124.26	125.20	1093	-0.94	29.45
500	*-89.80*	-268.68	128.09	129.30	1093	-1.21	29.18
700	*-89.80*	-271.21	130.62	131.80	1093	-3.88	26.50
1000	*-89.80*	-273.88	133.29	134.50	1093	-8.61	21.78
3000	*-100.26*	-279.09	118.84	141.90	1093	-23.06	7.32
6000	*-100.26*	-279.11	118.86	146.00	1093	-27.14	3.24

Table 7: SKA Phase 2 impact and mitigation requirement

6. CUMULATIVE IMPACT OF ADJACENT PROJECTS

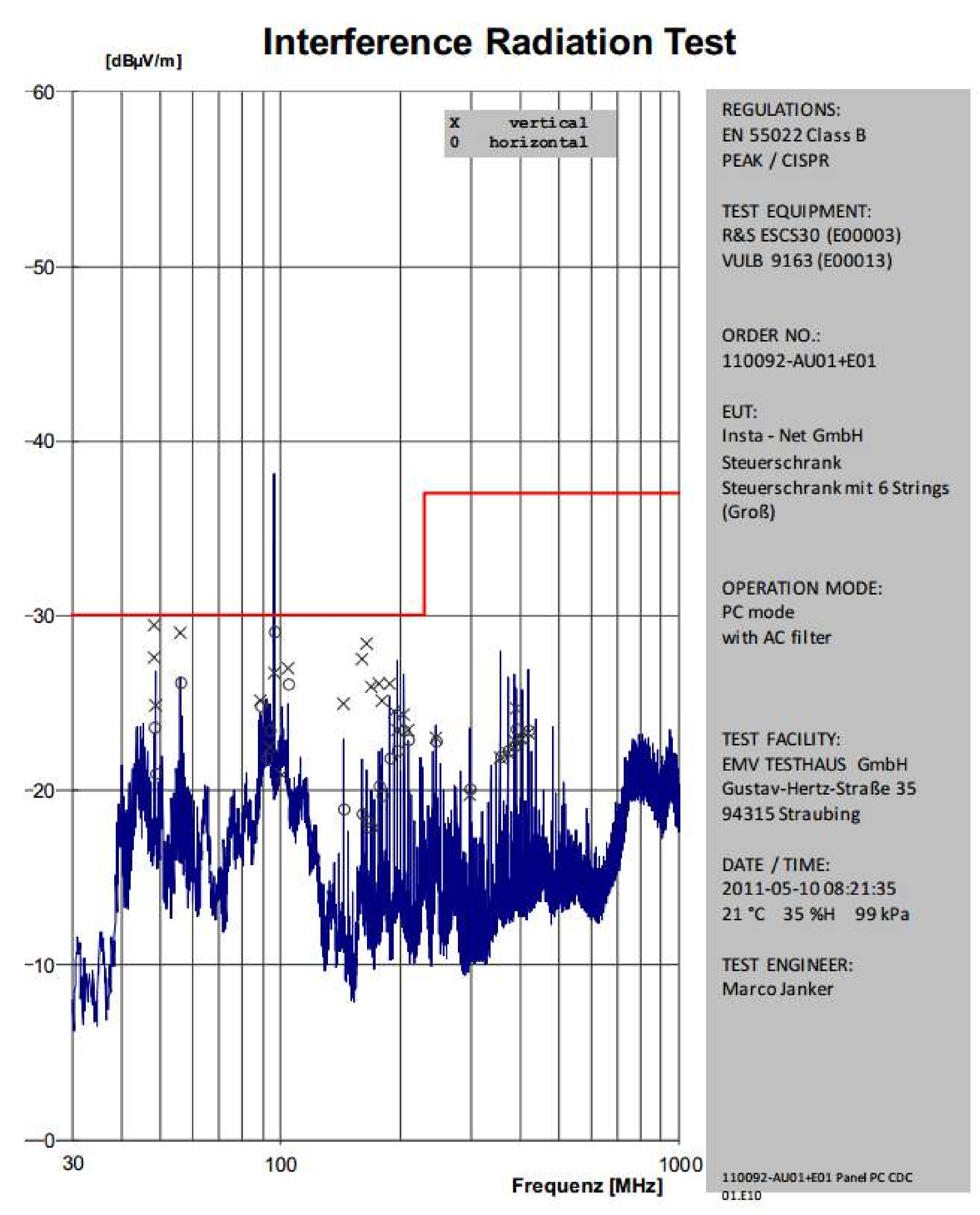
Assuming six nearby projects will continue and each project complies to the Radio Astronomy Protection Levels in Astronomy Advantage Areas, the additional mitigation required will be 8dB based on the calculations shown in 4.1.4.

7. CONCLUSION

Based on the current SKA location information, this impact analysis shows that without adequate mitigation a possible interference scenario between the Skeurhok Solar PV Energy Facility and the SKA installations may occur. 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 40dB..

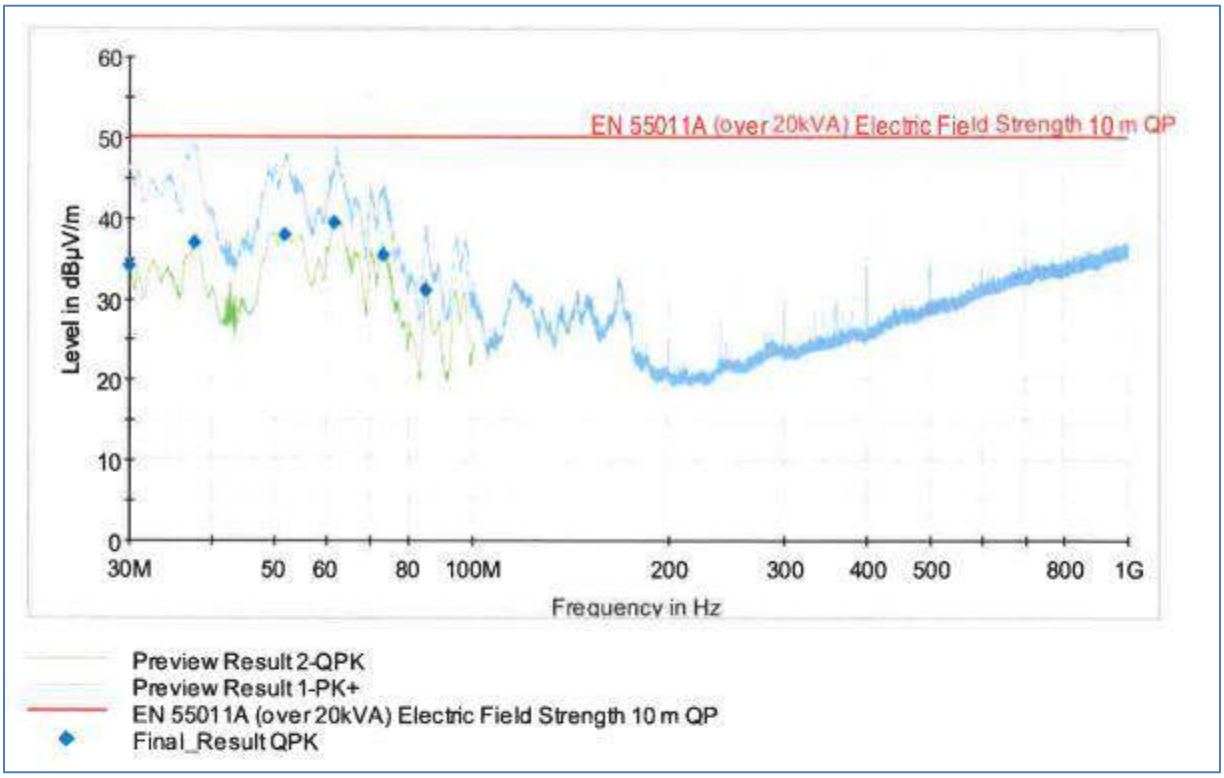
On-site measurement of the operational plant is proposed as a requirement. If such measurements find additional emission reductions to be necessary, measures such as additional shielding and EMC filters should, among others, be considered.

8. APPENDIX A: TRACKER AND DC COMBINER RESULTS

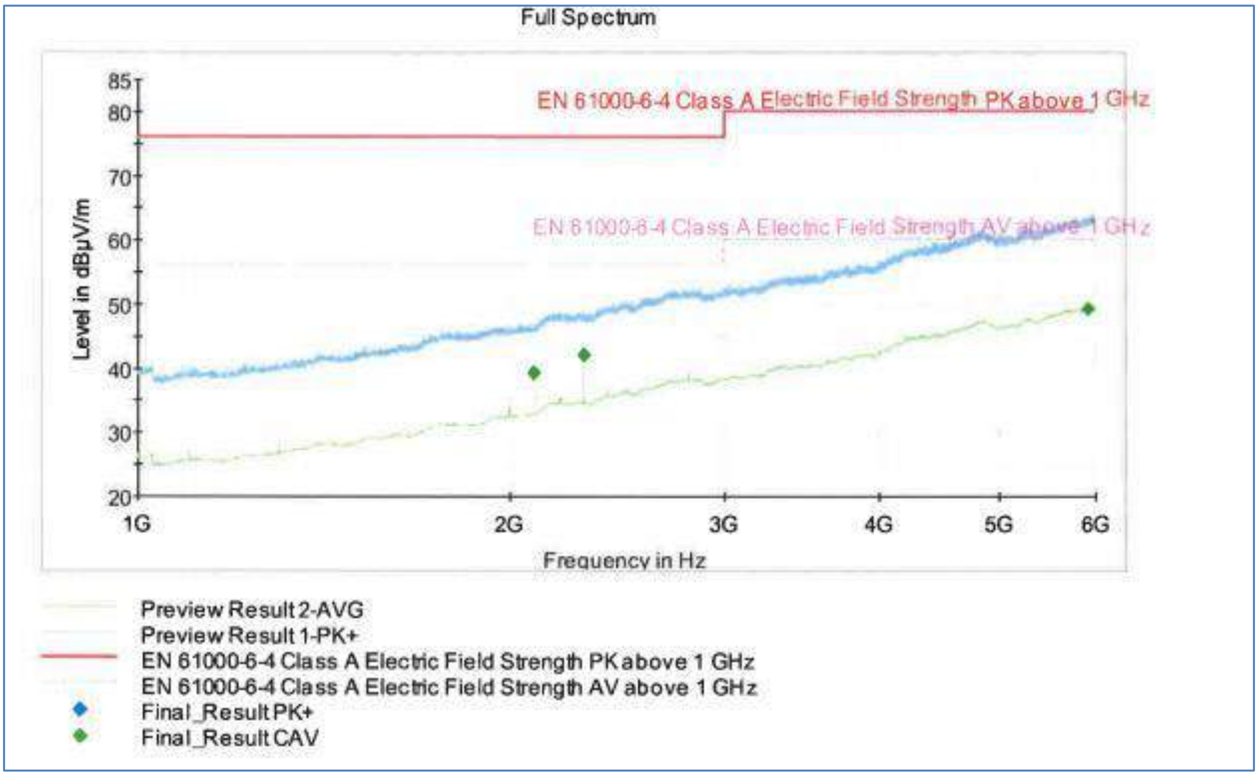


9. APPENDIX B: INVERTER TEST RESULT

9.1 RADIATED EMISSION <1GHZ



9.2 RADIATED EMISSIONS >1GHZ



10. APPENDIX C: SKEURHOK DESIGN SUMMARY

(Note: Kenhardt PV had to be renamed to Skeurhok to avoid name duplication)

401001212_Kenhardt PV1_South Africa_86,2 MWp

juwi

401001212 Kenhardt PV1 - South Africa

Design: Dung Vu Thi My

System: 1500 V

Modules: BYD 340P6D-36

253576x BYD 340P6D-36 = 86.215,84 kWp
Module dimensions: 1,961m length x 0,985m width
8744 strings with 29 modules each

Arrays (Tracker): Ideematec safeTrack Horizon

1093 Trackers consists of 4x2x20 & 2x2x18
Array Type: 2 row(s) with 29 modules each in Portrait mounting
1 array = electrical string(s) = 19,72 kWp
Tilt angle: +/- 45°, Azimuth: 0° East-West
Approx. array length: 28,845 m Array width: 3,942 m
Row spacing: 5 m or adjusted if necessary

DC Combiner Boxes

600x DC combiner boxes 16 inputs, 1 string per DCB input

Solar cables 4mm² 733 km

Connectors +/- 17488

Inverters: ABB PVS980-1909 kVA-J
Nominal AC Power: 1909kWAC

Inverter Station

1 inverter per station

Earthing:

All frame metal work to be bonded to earth with a minimum 16mm², corrosion protection of bonding points. Earthing Cable to be laid in the MV Cable trenches. All earthing shall meet the minimum requirements of SANS 10142-1 & SANS 10142-2

Comms:

The data communication network shall consist exclusively of fibre optic cabling

Rev.	Description	Date	Created	Page
R 1	Rough Configuration	09.02.2017	DUN	1/1

DRAFT EIA REPORT

Scoping and Environmental Impact Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (SKEERHOK PV 2) on Portion 9 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape Province

PART B:

ENVIRONMENTAL MANAGEMENT PROGRAMME

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

This Environmental Management Programme (EMPr) has been prepared as part of the requirements of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2014 amended Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R325 on 7 April 2017. This EMPr is being submitted to the National Department of Environmental Affairs (DEA) as part of the Application for Environmental Authorisation (EA) for the proposed construction of a 100 Megawatt (MW) Solar Energy Facility (SEF) and associated electrical infrastructure on Portion 0 of Smutshoek Farm 395, approximately 70 km south of Upington and 43 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province (Figure 1). The proposed project is referred to as Skeerhok PV 2 and has been assigned the following DEA Reference Number: 14/12/16/3/3/2/1034. The Project Applicant for this proposed 100 MWac solar PV project is juwi Renewable Energies (PTY) Ltd (hereinafter referred to as juwi).

This EMPr is being made available to Interested and Affected Parties (I&APs), stakeholders and Organs of State, as part of the EIA Report, for a 30-day review period. Comments received from stakeholders during this aforementioned review period will be incorporated into the EMPr, where applicable. Following the incorporation of comments from I&APs, stakeholders and Organs of State, this EMPr is intended as a “living” document and should continue to be updated regularly, as needed.

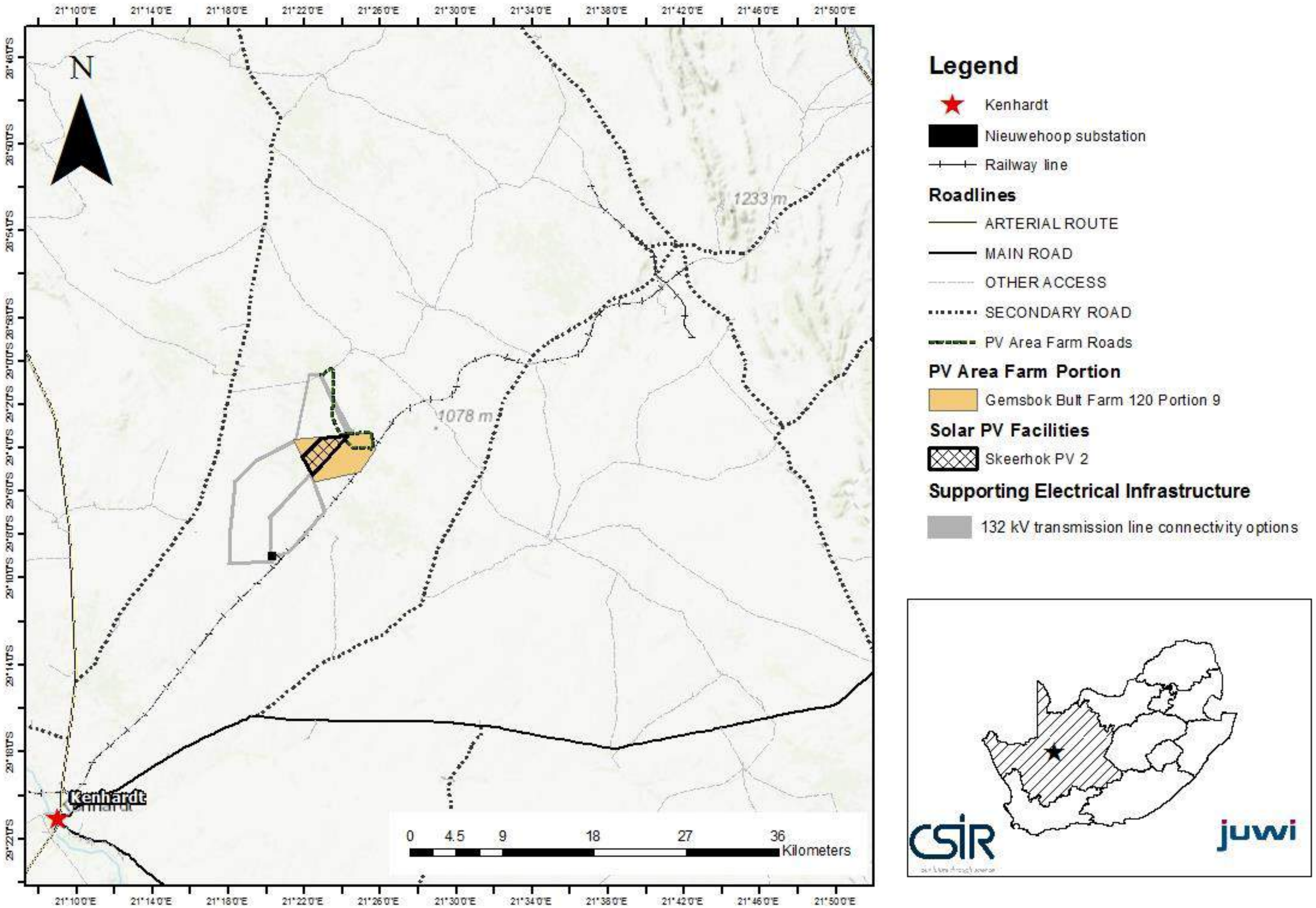


Figure 1: Locality map for the proposed Skeerhok Solar Photovoltaic 2 Facility near Kenhardt in the Northern Cape.

1.1 PROJECT DESCRIPTION

The proposed project will make use of PV solar technology to generate electricity from the sun's energy. The project is being developed with a maximum possible installed capacity 100 MWac of electricity. Once commercial operation date is achieved, the proposed facility will generate electricity for a minimum period of 20 years. The property on which the SEF is to be constructed will be leased by the project owner from the property owners for the life span of the project. It is proposed that juwi will implement the Self-Build Option for the additional electrical infrastructure to be constructed (which will be assessed separately as part of a Basic Assessment (BA) Process). Following the construction phase, the proposed transmission line will either be transferred into the ownership of Eskom.

The SEF will consist of the following components:

- ***Solar Field:***
  - ≤250 ha of photovoltaic (PV) modules mounted on free field single-axis trackers or fixed tilt PV solar module mounting structures comprised of galvanised steel and aluminium; and
  - below ground electrical cables connecting the PV arrays to the inverter stations, O&M building and collector substation; and
  - Ring main units; and
  - Inverters and mini-subs.

- ***Collector substation:***
  - ≤1 ha 22/33 kV to 132 kV collector substation to receive, convert and step up electricity from the PV facility to the 132 kV grid suitable supply. The facility will house control rooms and grid control yards for both Eskom and the Independent Power Producer. A 32 m telecommunications tower (lattice or monopole type) will be established in the substation area;

- ***O&M area:***
  - Operations and Maintenance (O&M) buildings;
  - ≤1 ha hectare O&M laydown area (near / adjacent substation);
  - ≤0.01 ha solar measuring station;
  - Parking, reception area, offices, guest accommodations and ablution facilities for operational staff, security and visitors;
  - Workshops, storage areas for materials and spare parts;
  - Water storage tanks or lined ponds (~160 kl/day during first 3 months; ~90 kl/day for 21 months during rest of construction period; ~20 kl/day during operation);
  - Septic tanks and sewer lines to service ablution facilities; and
  - Central Waste collection and storage area.

- ***Battery Storage System:***
  - 100 MWh Battery Storage Facility with a maximum height of 8m and associated operational, safety and control infrastructure.

- ***Access road:***
  - ≤ 15 km long, ≤8 m wide gravel access road running from the Transnet Service Road to the site

- ***Service roads:***
  - ≤10 km of ≤ 6m wide gravel internal service roads within the plant boundary;

- ***Other infrastructure:***
  - Perimeter fencing and internal security fencing and gates as required.
  - Access control gate and guard house on access road;
  - ≤3.5 km length of water supply pipeline connecting existing boreholes to storage, alternatively water will be supplied by the local municipality.
  - Stormwater drainage

- ***Construction site office area (used during construction and rehabilitated thereafter):***
  - ≤1 ha site office area;
  - ≤ 10 ha laydown area; and
  - ≤1 ha concrete batching plant

The Skeerhok PV 2 project will connect to the Eskom Nieuwehoop Substation located on Portion 3 of Gemsbok Bult Farm 120 via a 132 kV overhead transmission line (the development of the 132 kV line will be considered under a separate BA process).

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

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

Activities will be undertaken during each phase which may cause an environmental impact. These activities have therefore been considered by the appointed specialists, and considered during the EIA and management and mitigation measures required to address all the impacts included within this EMPr.

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

- Transportation of personnel to and from the site, construction material and equipment to the site;
- Construction of the site camp and laydown areas, as well as dedicated access routes from the laydown areas to the working areas;
- Vegetation clearing in the areas required for building infrastructure and brush cutting in the solar field area where the panels will be installed;
- Excavations for infrastructure and associated infrastructure;
- Establishment of a laydown area for equipment;
- Construction of internal access roads, where required;
- Stockpiling of soil and cleared vegetation; and
- Construction of the solar field (consisting of the solar arrays and buildings) and additional infrastructure.

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

- Generation of 100 MWac of electricity to add to the national grid; and
- Maintenance of the solar facility, including washing of panels.

The projected operations are expected to provide several services and added economic spin offs. The solar facility is expected to be operational for a minimum period of 20 years.

Should it be decided not to extend the operational lifespan of the project beyond 20 years, the project will be decommissioned. The main aim of decommissioning is to return the land to its original, pre-construction condition. Decommissioning involves removing the solar panels and associated infrastructures, and covering the concrete footings with soil to a depth sufficient for the re-growth of natural vegetation. Any supporting infrastructure no longer in use will be removed from the site and either disposed of at a registered disposal facility or recycled if possible.

1.2 ENVIRONMENTAL SENSITIVITY AND PROJECT LAYOUT

The total area of Portion 0 of Smutshoek Farm 395, where the proposed SEF will be constructed, is approximately 2,000 hectares (ha). The assessed area includes approximately 400 ha of land but the proposed SEF will cover an approximate area of 300 ha, accounting for 15 % of the total area of the farm. The larger 400 ha buildable area was considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities can be avoided in the final siting and location of the proposed facility. Based on the findings of the specialist studies, an environmental sensitivity map was compiled (Figure 2). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 400 ha site that was assessed.

The key environmental sensitivities identified on site and shown in Figure 2 are:

- An excavated pan occurs alongside the southern boundary of the site. The now eroded spoils of this excavation have revealed the presence of Early, Middle and Later Stone Age stone artefacts in the gravels that underlie the present surface. Although these artefacts are not in very high density, the pan has been avoided within the Development Envelope;
- Dendritic drainage were identified to occur to the extreme north of the site.

No other sites were deemed of ecological significance by the specialists. Based on this map, the preferred location for the 300 ha Skeerhok PV 2 facility, also known as the Development Envelope, avoids the sensitive features that were identified by the specialists within the original 400 ha assessed. The Development Envelope is considered to be a “box” in which the proposed project components discussed within this chapter can be constructed at whichever location (within the boundaries of the assessed Development Envelope) without requiring an additional assessment or change in impact significance. Any changes to the layout are therefore considered to be non-substantive. This is further discussed in Chapter 7 of this EIA Report.

Based on the boundaries of the Development Envelope, the environmental sensitivities identified on site and the site layout determined for this project are shown in Figure 2.

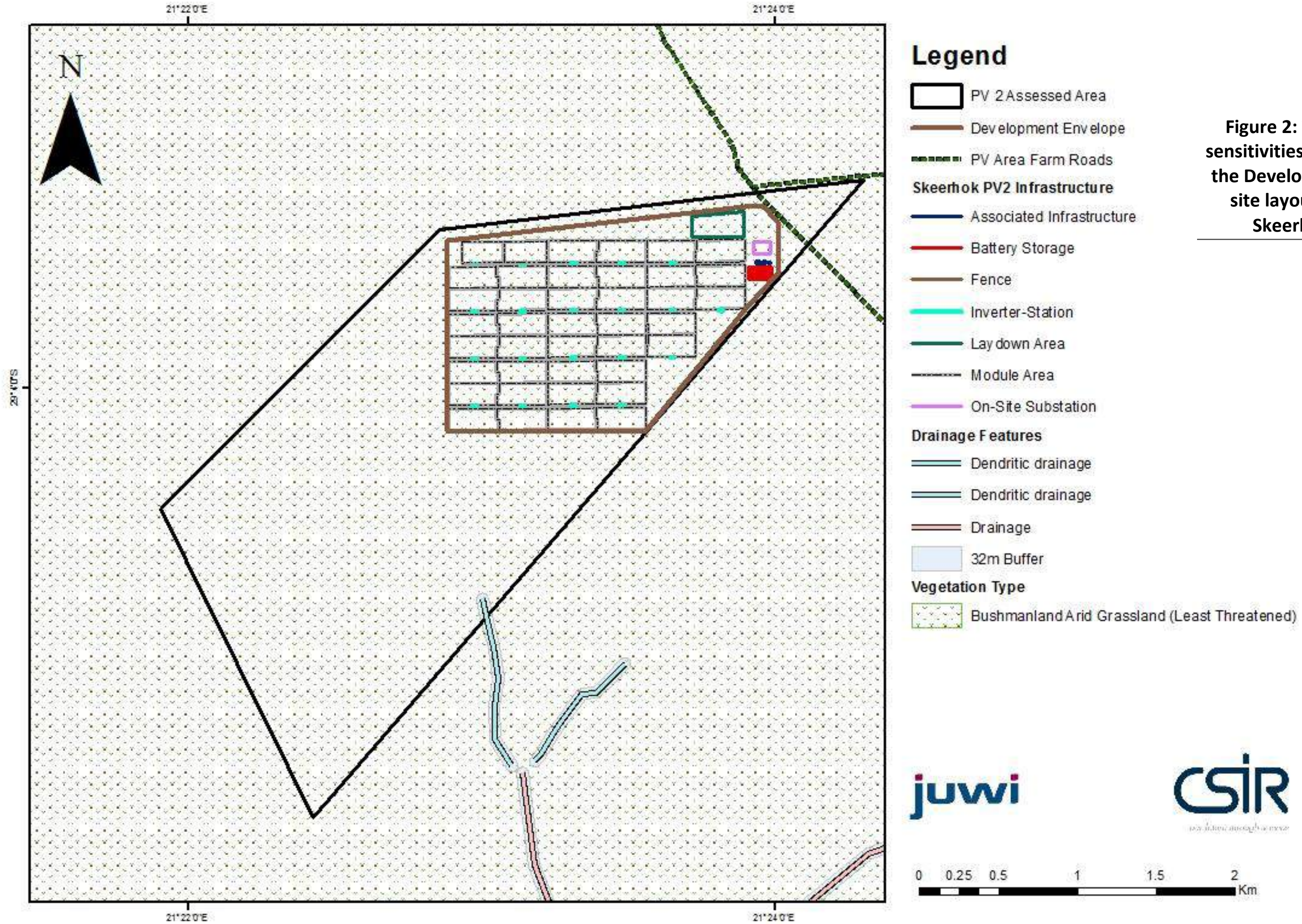


Figure 2: The environmental sensitivities on site overlain with the Development Envelope and site layout of the proposed Skeerhok PV 2 facility

1.3 AUTHORS OF THE EMPr

This EMPr has been compiled by the Environmental Assessment Practitioner (EAP) and the various specialists on the team (as indicated in Table 1). The details and expertise of the EAP and the specialists are provided in Appendix A of the EIA Report. The expertise of the EAP who compiled the report is provided below:

Kelly Stroebel holds a Bachelor of Science with Honours in Environmental Science from Rhodes University in Grahamstown and is currently pursuing a Masters at the University of Stellenbosch. Her undergraduate degree was a Bachelor of Science with majors in Environmental Science and Zoology. Kelly has been the Project Manager of several EIA's in South Africa and several Basic Assessments for the Special Needs and Skills Development Programme. She has assisted in the SIP projects including the National Wind & Solar Strategic Environmental Assessment (SEA) and Electricity Grid Infrastructure SEA as SEAs which were commissioned by the National Department of Environmental Affairs.

Table 1: The EIA Team

NAME	ORGANISATION	ROLE/ SPECIALIST STUDY UNDERTAKEN
Environmental Assessment Practitioners		
Kelly Stroebel	CSIR	Project Manager (*Cand. Sci. Nat.)*
Surina Laurie	CSIR	Project Leader (*Pr. Sci. Nat.)*
Babalwa Mqokeli	CSIR	Project Officer (*Cand. Sci. Nat.*)
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Specialists		
Simon Bundy	Sustainable Development Projects cc	Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)
Jon Smallie	Wildskies Ecological Services	Avifauna Impact Assessment
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
Dr. John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
Luanita Snyman-Van der Walt	CSIR	Visual Impact Assessment

An Electromagnetic Interference and Radio Frequency Interference Survey Technical Study was commissioned by juwi to determine the impact of the proposed project on the Square Kilometre Array (SKA). This report is not a standard specialist study in terms of Appendix 6 of the EIA Regulations, as it is a detailed, technical report which provides a cumulative topographical analysis of the proposed PV projects in the Astronomy Geographic Advantage Area and was undertaken to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project.

1.4 IMPACTS IDENTIFIED DURING THE EIA PROCESS

Based on the specialist studies, the following main direct potential impacts, as indicated in Table 2, have been identified and appropriate management and mitigation measures included within the EMPr (where required) as per the recommendations made in the specialist studies to ensure the potential impacts are suitably addressed and managed during all phases of the project.

It should be noted that other impacts for which specialist studies were not undertaken but where mitigation or management actions may be required, are also included in the EMPr.

Table 2: Key Impacts identified during the EIA process

KEY IMPACT	IMPACTS IDENTIFIED
Terrestrial Ecology, Aquatic Ecology and Avifauna	**Construction Phase:** ▪ Alteration of habitat structure and composition. ▪ The ousting (and recruitment) of fauna through anthropogenic activities, disturbance of refugia and general change in habitat. ▪ Alteration of surface drainage patterns due to construction activities leading to change in plant communities and general habitat structure. ▪ Changes in subsurface water resources. ▪ Alteration of the availability of water to plants within the site due to the introduction of water to site by import, which may lead to changes in habitat form and structure around areas that receive such import. ▪ Alteration of surface water quality that lead to change in water chemistry. ▪ 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. ▪ Increased Electrical Light Pollution (ELP), 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. ▪ Invasion of exotic weeds. **Operational Phase:** ▪ Continued alteration of habitat structure and composition on account of continuing low level anthropogenic impacts, such as "shading of vegetation" from PV arrays ▪ Ousting (and recruitment) of various fauna on account of long term changes in the surrounding habitat. ▪ Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility. ▪ 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 on account of 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. ▪ Invasion of exotic weeds as a consequence of regular and continued disturbance within the site. ▪ Impact on faunal behaviour, leading to the exclusion of certain species and possible mortalities, due to the fencing of the site, possibly electric fencing. **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.

KEY IMPACT	IMPACTS IDENTIFIED
	▪ Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment. ▪ Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures.
Visual	**Construction Phase:** ▪ Potential visual intrusion of construction activities on existing views of sensitive visual receptors. **Operational Phase:** ▪ Potential landscape impact of a large solar energy facility on a rural agricultural landscape. ▪ Potential visual intrusion of the proposed solar energy facility on the views of sensitive visual receptors. ▪ Potential impact of night lighting of a large solar energy facility on the nightscape of the region. **Decommissioning Phase:** ▪ Potential visual intrusion of decommissioning activities on views of sensitive visual receptors.
Heritage (Archaeology and Cultural Landscape)	**Construction Phase:** ▪ Destruction of archaeological resources. ▪ Destruction of graves. ▪ Impacts to the natural and cultural landscape. **Operational Phase:** ▪ Impacts to the natural and cultural landscape **Decommissioning Phase:** ▪ Impacts to the natural and cultural landscape
Palaeontology	**Construction Phase:** ▪ 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.
Geohydrology	**Construction Phase:** ▪ Potential impact on the groundwater as a result of the construction of storage yards and temporary labour accommodation; ▪ Potential impact of increased storm water outflows; and ▪ Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages. **Operational Phase:** ▪ Potential impact of increased storm water outflows; and ▪ Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages. **Decommissioning Phase:** ▪ Potential impact on groundwater quality as a result of accidental oil spillages and fuel leakages.
Soils and Agricultural Potential *Note: A Soils and Agricultural Potential Impact Statement was compiled by the CSIR.*	**Construction Phase:** ▪ Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to constructional disturbance and potential trampling by vehicles. ▪ Loss of topsoil due to poor topsoil management. ▪ Loss of agricultural land use. ▪ Soil erosion due to alteration of the land surface characteristics.

KEY IMPACT	IMPACTS IDENTIFIED
It is not a specialist study in terms of Appendix 6 of the EIA Regulations; however it provides a general description of the potential impacts on soils and agriculture. This Statement has been subject to a peer review process by an external reviewer.	▪ Additional land use income generation. **<u>Operational Phase:</u>** ▪ Loss of agricultural land use. ▪ Soil erosion due to alteration of the land surface characteristics. ▪ Additional land use income generation. **<u>Decommissioning Phase:</u>** ▪ Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to constructional disturbance and potential trampling by vehicles. ▪ Loss of topsoil due to poor topsoil management. ▪ Loss of agricultural land use. ▪ Soil erosion due to alteration of the land surface characteristics. ▪ Additional land use income generation.
Socio-Economic *Note: A Social Impact Statement was compiled by the CSIR. It is not a specialist study in terms of Appendix 6 of the EIA Regulations; however it provides a general description of the potential socio-economic impacts. This Statement has been subject to a peer review process by an external reviewer.*	**<u>Construction Phase:</u>** ▪ Influx of jobseekers. ▪ Increases in social deviance and increases in incidence of HIV/AIDS infections. ▪ Expectations regarding employment. ▪ Local spending. ▪ Local employment. ▪ Human development resulting from the proposed Economic Development Plan. **<u>Operational Phase:</u>** ▪ Influx of jobseekers. ▪ Increases in social deviance and increases in incidence of HIV/AIDS infections. ▪ Expectations regarding employment. ▪ Local spending. ▪ Local employment. ▪ Human development resulting from the proposed Economic Development Plan. **<u>Decommissioning Phase:</u>** ▪ Job losses at the end of the project life-cycle.
Traffic *Note: A Traffic Impact Statement was compiled by the CSIR. It is not a specialist study in terms of Appendix 6 of the EIA Regulations; however it provides a general description of the potential traffic impacts. This Statement has been subject to a peer review process by an external reviewer.*	**<u>Construction, Operational and Decommissioning Phases</u>** ▪ Increase in traffic generation. ▪ Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads. ▪ Impact on air quality due to noise and release of air pollutants from vehicles and construction equipment. ▪ Decrease in quality of surface condition of the roads.

2 APPROACH TO PREPARING THE EMPr

2.1 COMPLIANCE WITH RELEVANT LEGISLATION

In terms of legal requirements, a crucial objective of the EMPr is to satisfy the requirements of Section 24N of the NEMA, as amended, and Appendix 4 of the amended NEMA EIA Regulations published in Government Notice No. R 326 of 7 April 2017. These regulations prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities. An overview of where the requirements are addressed in this EMPr is presented in Tables 3 and 4.

Table 3: Compliance with Section 24N of NEMA

Requirements of Section 24N of NEMA	Where it is included in this EMPr
2) The environmental management programme must contain- a) information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of- (i) planning and design; (ii) pre-construction and construction activities; (iii) the operation or undertaking of the activity in question; (iv) the rehabilitation of the environment; and (v) (v) closure, if applicable;	Section 1.3 and the columns detailing the impact description, mitigation and management objectives, and mitigation and management actions in Sections 4 to 12 of this EMPr.
b) details of- (i) the person who prepared the environmental management programme; and (ii) the expertise of that person to prepare an environmental management programme;	Section 1.2 and Appendix A of the EIA Report
c) a detailed description of the aspects of the activity that are covered by the environmental management programme;	Section 1 and Section 1.1
d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);	Columns in Section 4 to 12 of the EMPr regarding the monitoring responsibility, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3.
e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance;	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 of this EMPr.
f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and	Sections 4 to 12 of this EMPr, as applicable to the post-construction, rehabilitation phase and the decommissioning phase.
g) a description of the manner in which it intends to- (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; and	The columns detailing the mitigation and management objectives, mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 of this EMPr.

Requirements of Section 24N of NEMA	Where it is included in this EMPr
(iii) comply with any prescribed environmental management standards or practices.	
3) The environmental management programme must, where appropriate- a) set out time periods within which the measures contemplated in the environmental management programme must be implemented; b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation which may occur inside and outside the boundaries of the operations in question; and c) develop an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 of this EMPr. Section 11 of this EMPr includes an Environmental Awareness Plan.
5) The Minister, the Minister responsible for mineral resources or an MEC may call for additional information and may direct that the environmental management programme in question must be adjusted in such a way as the Minister, the Minister responsible for mineral resources or the MEC may require.	Not applicable at this stage.
6) The Minister, the Minister responsible for mineral resources or an MEC may at any time after he or she has approved an application for an environmental authorisation approve an amended environmental management programme.	Not applicable at this stage.
7) The holder and any person issued with an environmental authorisation- a) must at all times give effect to the general objectives of integrated environmental management laid down in section 23; b) must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment; c) must manage all environmental impacts (i) in accordance with his or her approved environmental management programme, where appropriate; and (ii) as an integral part of the prospecting or mining, exploration or production operation, unless the Minister responsible for mineral resources directs otherwise; d) must monitor and audit compliance with the requirements of the environmental management programme; e) must, as far as is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and f) is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations to which such right, permit or environmental authorisation relates.	Throughout the EMPr

Requirements of Section 24N of NEMA	Where it is included in this EMPr
8) Notwithstanding the Companies Act, 2008 (Act No. 71 of 2008), or the Close Corporations Act, 1984 (Act No. 69 of 1984), the directors of a company or members of a close corporation are jointly and severally liable for any negative impact on the environment, whether advertently or inadvertently caused by the company or close corporation which they represent, including damage, degradation or pollution.	Section 3 details the responsibility of the Project Applicant.

Table 4: Appendix 4 of the amended EIA Regulations

Requirements of Appendix 4 of the 2014 amended NEMA EIA Regulations GN R 326	Where it is included in this EMPr?
1. (1) An EMPr must comply with section 24N of the Act and include: (a) details of: (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Section 1.2 and Appendix A of the EIA Report
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 1 and Section 1.1
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Figure 2 and Appendix A of this EMPr.
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including: (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post (v) closure; and (vi) where relevant, operation activities;	Section 1.4 and the columns detailing the impact description, mitigation and management objectives, and mitigation and management actions in Sections 4 to 12 of this EMPr.
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to: (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	The columns detailing the mitigation and management actions in Sections 4 to 12 of this EMPr.
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	The columns detailing the monitoring methodology in Sections 4 to 12 of this EMPr.
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	The columns detailing the monitoring frequency in Sections 4 to 12 of this EMPr.
(i) an indication of the persons who will be responsible for the	The columns detailing the monitoring

Requirements of Appendix 4 of the 2014 amended NEMA EIA Regulations GN R 326	Where it is included in this EMPr?
implementation of the impact management actions;	responsibility in Sections 4 to 12 of this EMPr.
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	The columns detailing the mitigation and management actions, and the monitoring methodology and frequency in Sections 4 to 12 of this EMPr.
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 of this EMPr.
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 4 to 12 of the EMPr, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3.
(m) an environmental awareness plan describing the manner in which: (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 11 of this EMPr.
(n) any specific information that may be required by the competent authority.	Section 2.2 and the management objectives and management actions in Sections 4 to 11.

2.2 COMPLIANCE WITH DEA REQUIREMENTS

The Final Scoping Report was submitted to the DEA on the 3rd of November 2017, in accordance with Regulation 21 (1) of the amended 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 22 of the amended 2014 NEMA EIA Regulations. The DEA accepted the Final Scoping Report and Plan of Study for EIA on 30 November 2017, which marked the end of the Scoping Phase. The acceptance letter is included in Appendix G of the EIA Report.

The requirements listed in the acceptance letter from the DEA (dated 30 November 2017), stipulated certain plans that must be included in the EMPr. The EMPr is therefore structured in such a way to comply with the requirements of the DEA and to ensure that the mitigation and management measures that have been identified during the EIA Process are included in the respective plans. The requirements listed within the acceptance letter are detailed in Table 5.

It is important to note that other project specific aspects (such as the findings and recommendations of the specialist studies), in addition to those covered by the plans required by the DEA, have been included in Section 12 of the EMPr.

Table 5: DEA Requirement for the EMPr

DEA Requirements	Relevant Section in the EMPr
i. All recommendations and mitigation measures recorded in the EIA Report and the specialist studies conducted.	Recommended mitigation measures and monitoring actions as noted in the EIA Report and specialist studies have been included in this EMPr, where relevant.
ii. The final site layout map	Refer to Appendix A of this EMPr for the site layout map. Refer to Section 1.1 of this EMPr for a description of the approach followed to determine the site layout.
iii. Measures as dictated by the final site layout map and micro-siting.	Refer to Appendix A of this EMPr for the site layout map. Refer to Section 1.1 of this EMPr for a description of the approach followed to determine the site layout.
iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA Process.	Refer to Appendix B of this EMPr for an environmental sensitivity map. Refer to Section 1.1 of this EMPr for a description of the approach followed to identify the environmental sensitivities.
v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	Refer to Appendix A of this EMPr for a combined environmental sensitivity and layout map. Refer to Section 1.1 of this EMPr for a description of the approach followed to identify the environmental sensitivities and to determine the site layout.
vi. An alien invasive management plan to be implemented during the construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	Refer to Section 4 of this EMPr.
vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	Refer to Section 5 of this EMPr. It should be noted that faunal protection and habitat rehabilitation has also been included in this section.
viii. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Refer to Section 5 of this EMPr. It should be noted that faunal protection and habitat rehabilitation has also been included in this section.
ix. An open space management plan to be implemented during the construction and operation of the facility.	Refer to Section 6 of this EMPr.
x. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	Refer to Section 7 of this EMPr.
xi. A transportation plan for the transport of components, main	Refer to Section 7 of this EMPr.

DEA Requirements	Relevant Section in the EMPr
assembly cranes and other large pieces of equipment.	
xii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must 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 must promote the dissipation of storm water run-off.	Refer to Section 8 of this EMPr.
xiii. A fire management plan to be implemented during the construction and operation of the facility.	Refer to Section 11 of this EMPr. It should be noted that this has been combined with an Environmental Awareness Plan.
xiv. An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	Refer to Section 9 of this EMPr.
xv. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems	Refer to Section 10 of this EMPr.
xvi. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments have been included throughout the EMPr, such as Sections 8, 9 and 10.

2.3 CONTENTS OF THE EMPr

Where applicable, each section of the EMPr is divided into the following four phases of the project cycle:

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

The EMPr includes the findings and recommendations of the EIA Process and specialists studies. However, the EMPr is considered a “living” document and must be updated with additional information or actions during the design, construction, operational and decommissioning phases if applicable.

The EMPr follows an approach of identifying an over-arching goal and objectives, accompanied by management actions that are aimed at achieving these objectives. The management actions are presented in a table format in order to show the links between the goal and associated objectives, actions, responsibilities, and monitoring requirements and targets.

The management plans for the design, construction, operational and decommissioning phases consist of the following components:

- **Impact:** The potential positive or negative impact of the development that needs to be enhanced, mitigated or eliminated.
- **Objectives:** The objectives necessary in order to meet the goal; these take into account the findings of the specialist studies.
- **Mitigation/Management Actions**: The actions needed to achieve the objectives of enhancing, mitigating or eliminating impacts; taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.
- **Monitoring**: The key monitoring actions required to check whether the objectives are being achieved, taking into consideration methodology, frequency and responsibility.

2.4 GOAL FOR ENVIRONMENTAL MANAGEMENT

The overall goal for environmental management for the proposed Skeerhok PV 2 project is to construct and operate the project in a manner that:

- Minimises the ecological footprint of the project on the local environment;
- Minimises impacts on fauna, flora and freshwater ecosystems;
- Facilitates harmonious co-existence between the project and other land uses in the area; and
- Contributes to the environmental baseline and understanding of environmental impacts of solar energy facility in a South African context.

3 ROLES AND RESPONSIBILITIES

For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- Project Owner;
- Environmental Control Officer;
- Construction Manager (Lead Contractor); and
- Facility Manager.

Note: The specific titles for these functions will vary from project to project. The intent of this section is to give a generic outline of what these roles typically require. It is expected that this will be appropriately defined at a later stage.

3.1 PROJECT OWNER

The Project Developer (i.e. juwi Renewable Energies) is the current ‘owner’ of the project and, as such, is responsible for ensuring that the conditions of the EA issued in terms of NEMA (should the project receive such authorisation) are fully adhered to, as well as ensuring that any other necessary permits or licences are obtained and complied with. It is expected that the project owner at the point of construction will appoint the Environmental Control Officer and the Lead Contractor, and possibly an Environmental Manager (or Health, Safety and Environmental Manager).

3.2 ENVIRONMENTAL CONTROL OFFICER

An independent Environmental Control Officer (ECO) must be appointed to ensure that the provisions of the EMPr as well as the conditions of the EA (should such authorization be granted by DEA) are complied with at all times. The ECO must also monitor compliance of the proposed project with environmental legislation and recommendations of the EMPr, as well as oversee the implementation of the EMPr during the phases of the project, monitor environmental impacts, undertake record-keeping.

The ECO will be responsible for updating the EMPr as and when necessary, and compiling a monitoring checklist based on the EMPr. The roles and responsibilities of the ECO should include the following:

- The ECO must undertake periodic environmental audits during the relevant phases of the proposed project in order to monitor and record environmental impacts and non-conformances, and to monitor site activities to ensure adherence to the specifications contained in the EMPr, using a monitoring checklist. The timeframes for environmental audits will be indicated in the EA (should such authorisation be granted by the DEA).
- Environmental compliance/audit reports must be compiled and submitted by the ECO to the Competent Authority (i.e. DEA and/or Provincial Department of Environment and Nature Conservation) on a regular basis (i.e. at intervals as indicated in the EA (should such authorisation be granted by the DEA)).
- The ECO must maintain a diary of site visits and audits, a copy of the Environmental Authorisation (should such authorisation be granted by the DEA) and relevant permits for reference purposes, a non-conformance register, a public complaint register, and a copy of previous environmental audits undertaken.
- Prior to the commencement of construction, the ECO must meet on site with the Contractor to confirm the construction procedure and designated construction areas and work activity zones.
- Reporting of any non-conformances within 48 hours of identification of such non-conformance to the relevant agents.
- Conducting an environmental inspection on completion of the construction period and 'signing off' the construction process with the Contractor.
- Ensure that records are kept of all monitoring activities and results.
- Conducting an environmental inspection on completion of decommissioning and 'signing off' the site rehabilitation process.

The Lead Contractor and sub-contractors may have their own Environmental Officers, or designate Environmental Officer functions to certain personnel.

3.3 CONSTRUCTION MANAGER

The Construction Manager will be responsible for the following:

- Ensure that all appointed contractors and sub-contractors are aware of the EMPr and their respective responsibilities;
- Prior to the commencement of construction, the Lead Contractor must meet on site with the ECO in order to confirm the construction procedure and designated construction areas and work activity zones.
- Ensure that each sub-contractor employs an Environmental Officer (or employs a designated suitably qualified individual to fulfil the role of an Environmental Officer) to monitor and report on the daily activities on-site during the construction period;

- Implementation of the overall construction programme, project delivery and quality control for the construction for the solar project;
- Overseeing compliance with the Health, Safety and Environmental Responsibilities specific to the project management related to project construction;
- Promoting total job safety and environmental awareness by employees, contractors and sub-contractors and stress to all employees and contractors and sub-contractors the importance that the project proponent attaches to safety and the environment;
- Ensuring that safe, environmentally acceptable working methods and practices are implemented and that sufficient plant and equipment is made available properly operated and maintained, to facilitate proper access and enable any operational to be carried out safely;
- Ensuring that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the EMPr, to the satisfaction of the Project Owner's ECO;
- Implement the Traffic Management Plan (Section 7), Transportation Plan (Section 7) and Storm Water Management Plan (Section 8).

3.4 FACILITY MANAGER

The Facility Manager will be responsible for the following:

- Operation of the 100 MWac Solar PV facility;
- Required maintenance of the facility; and
- Overall compliance with the EMPr and EA (should such authorisation be granted by the DEA).

4 ALIEN INVASIVE VEGETATION MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
A. DESIGN PHASE					
4.1. Impacts due to establishment of alien invasive plants.	Ensure the appropriate removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	4.1.1. Compile an alien and invasive species control and monitoring plan as required in the Alien and Invasive Species Regulations under the National Environmental Management Biodiversity Act (Act 10 of 2004). 4.1.2. Ensure compliance with relevant Environmental Specifications for the control and removal of alien invasive plant species. 4.1.3. Compile and finalise an alien weed eradication programme.	▪ Ensure that this is done and taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. ▪ Appoint a suitable specialist/ Contractor or contact the relevant authorities to seek guidance on the removal of the planted alien invasive species. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase. ▪ Once-off during the design phase with possible follow up tasks during the construction phase. ▪ Once-off during the design phase.	▪ Project Owner ▪ Project Owner and ECO ▪ ECO
B. CONSTRUCTION PHASE					
4.2. Impacts due to the establishment of and increased spread of alien invasive plants.	Avoid establishment and reduce the spread of alien invasive plants due to the project activities.	4.2.1. Appoint a suitable specialist or contractor to undertake a sweep and survey of the final development footprint site, with an alien invasive eradication team to remove exotic vegetation prior to the commencement of construction. 4.2.2. Establish an ongoing monitoring programme for the construction phase to detect and	▪ Appoint a suitable vegetation contractor to inspect the site and remove any exotic weeds prior to the commencement of construction. ECO to ensure that this is taken into consideration and implemented. ▪ Prepare monitoring programme	▪ Prior to the commencement of construction. ▪ Once-off	▪ Project Owner, ECO and Specialist Contractor ▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) and National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM: BA)).	which will monitor the presence of alien invasive species on the site. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of concentrations of plants). The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area.		
		4.2.3. Ensure proper management of soil stockpiles. Do not import soil stockpiles from areas with alien plants to ensure proper management of stockpiles.	▪ Monitor the presence of alien invasive plants during the construction phase via visual inspections and take action to remove and control these species.	▪ On-going	▪ ECO and Contractor
		4.2.4. Undertake rehabilitation of disturbed areas as soon as possible after construction. Stockpile the shallow topsoil layer separately from the subsoil layers. Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas.	▪ Rehabilitate disturbed areas and monitor the presence of alien invasive species on site.	▪ On-going	▪ ECO and Contractor
		4.2.5. Keep clearance and disturbance of indigenous vegetation to a minimum.	▪ Monitor and manage vegetation clearing by undertaking visual inspections to ensure minimal disturbance and to restrict activities to within demarcated areas.	▪ On-going	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		4.2.6. Ensure that the footprint required for the proposed project activities (such as temporary stockpiling, earthworks, storage areas, site establishment etc.) is kept at a minimum.	▪ Verify that the proposed project area is determined and outlined prior to the commencement of the construction phase by undertaking visual inspections.	▪ Once-off prior to construction and as required during the construction process.	▪ ECO and Contractor
		4.2.7. Ensure that alien invasive vegetation found on site, within the proposed project footprint, is immediately controlled and removed promptly, in a scheduled manner throughout the construction phase. The removal of alien vegetation on site during the construction phase should use registered control methods and take into consideration the Alien and Invasive Species Regulations published in terms of Section 97(1) of the NEM: BA, if applicable.	▪ Monitor the presence of alien invasive plants during the construction phase via visual inspections and take action to remove and control these species. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of concentrations of plants). The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. Any alien invasive should be cleared from site.	▪ On-going	▪ ECO and Contractor
		4.2.8. The removed alien invasive vegetation should be immediately disposed at a suitable waste disposal facility and should not be kept on site for prolonged periods of time, as this will enhance the spread of these species.	▪ Monitor the removal of the alien vegetation found on site via visual inspections.	▪ As necessary during the construction phase.	▪ ECO
		4.2.9. All construction machinery and plant equipment delivered to site for use during the construction phase should be cleaned in order to limit the introduction of alien	▪ Clean machinery and equipment prior to the construction phase. ▪ ECO to conduct visual inspections to verify that machinery and	▪ Prior to the commencement of construction. ▪ As necessary	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		species.	equipment are cleaned, and report any non-compliance.	during the construction phase.	
C. OPERATIONAL PHASE					
4.3. Impacts due to establishment of alien invasive plants. Exotic weed invasion may result in the ousting of natural vegetation and alteration of ecological processes on site, with incremental impacts on the adjacent veld types.	Reduce the establishment and spread of alien invasive plants. To remove exotic weeds as and when they may arise and thereby prevent alteration of local and adjacent habitat forms.	4.3.1. Continue with on-going monitoring programme to detect and quantify any alien species that may become established and identify the highly invasive species during the operation phase.	▪ Annual audit of project area and immediate surroundings. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of concentrations of plants). The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area.	▪ Annual	▪ Operations and Maintenance Contractor
		4.3.2. Immediately control any alien plants that become established using registered control methods. Use of herbicides and manual removal of alien vegetation on site where this may arise to be undertaken as advised by a specialist. Regular address and redress of weeds identified on site by a suitable contractor. The clearance of exotic weed to be undertaken bi-annually at a minimum and on a needs basis at an intermittent level.	▪ Monitor the use of herbicide sprays and manual removal of alien vegetation by undertaking visual inspections and reporting any non-compliance. ▪ Maintain register of weed spraying activities and ensure that herbicide use is recorded.	▪ Bi-annually	▪ Project Owner and Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions		Monitoring		
				Methodology	*Frequency*	*Responsibility*
D. DECOMMISSIONING PHASE						
4.4. Exotic weed invasion of the decommissioned site resulting in ecological change.	To prevent the excessive growth and propagation of exotic weeds on disturbed lands that formed a portion of the PV facility.	4.4.1.	All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level.	▪ Once off	▪ Lead Contractor with advice from specialist
		4.4.2.	Exotic weed control measures to be instituted through weed control programme. Regular redress of exotic weed through the use of herbicide and manual removal.	▪ Compile weed eradication programme for a period of 12 months after the decommissioning exercise. ▪ Appoint contractor to undertake the weed eradication programme.	▪ Weed eradication exercise to be undertaken every 6 months for a period of 12 months following decommissioning. ▪ Prior to the commencement of the decommissioning phase.	▪ Project Owner ▪ Project Owner

5 PLANT RESCUE AND PROTECTION PLAN INCLUDING RE-VEGETATION AND HABITAT REHABILITATION PLAN (INCLUDING FAUNA AND AVIFAUNA)

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. DESIGN PHASE					
5.1. The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat, with impacts on terrestrial and aquatic ecology as a result of the final site layout and routes of the access roads.	Avoidance of unnecessary disturbance to the site and surrounds, and to establish buffers where required.	5.1.1. Avoidance of northern drainage features during the design and layout of the proposed PV facility. Ensure that sensitive habitat and features (as defined in the Ecological Impact Assessment, Appendix I of the EIA Report) are considered in the design. 5.1.2. Incorporate minor drainage lines into design and avoid unnecessary disturbance, where applicable. Refer Appendix B and C of this EMPr. 5.1.3. Consider the most applicable access road to site (i.e. the unnamed farm road or the Transnet Service Road (subject to the discussions between the Applicant and Transnet Freight Rail). 5.1.4. Appoint a specialist or suitable contractor to identify any plant species on site that may require "rescue" as well as any exotic weeds/vegetation that require removal. Appoint a specialist team flush game from the construction area. 5.1.5. Consideration of the siting and layout of the temporary construction site and worker camp to avoid all sensitive areas as identified	▪ Review the site plan with the ECO and possibly an ecologist (if required). ▪ Appoint a specialist to oversee the final development footprint area and undertake search and rescue, game sweep and alien removal. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off, prior to the commencement of construction. ▪ Appoint specialist once-off, prior to the commencement of construction. ▪ Once-off during the planning and design phase.	▪ Project Developer and ECO ▪ Project Owner ▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		in the relevant specialist studies included in the EIA Report.			
5.2. Destruction of indigenous vegetation without relevant licences or permits.	Ensure compliance with relevant Provincial and National legislation in respect of habitat and vegetation forms.	5.2.1. Ensure the necessary permits or licences are identified and applied for as applicable for the removal of protected, indigenous vegetation. 5.2.2. Await response and provision of permit (as required) from the relevant Authorities prior to the removal of the indigenous species (if required). Once these permits are obtained, search and rescue must be undertaken for the indigenous species.	▪ Review the findings of the Ecological Impact Assessment and consider legislative requirements in respect of loss of indigenous vegetation etc. ▪ Appoint a suitable Search and Rescue Specialist/Contractor to undertake Search and Rescue. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off, prior to the commencement of construction ▪ Once-off, prior to the commencement of construction ▪ Once-off during the planning and design phase.	▪ Project Owner and ECO ▪ Project Owner , Specialist/ Contractor and ECO ▪ Project Owner
5.3. Loss of Species of Special Concern (SSC) and protected species and their habitats.	Minimise fragmentation and loss of SSC and protected species and their habitats through the careful siting and layout planning for the project.	5.3.1. Avoid the removal of listed SSC and protected species as far as possible.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the planning and design phase	▪ Project Owner
		5.3.2. A buffer zone of 32 m must be implemented from the edge of the drainage features on site (as shown in Appendix B and C of this EMPr), in which no development or activities should take place.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the planning and design phase	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
5.4. Impact on avian behaviour and avian species as a result of collision with infrastructure of the proposed PV facility.	Reduce impact on avifauna.	5.4.1. The PV panels should spend as little time as possible time in a vertical position since this presents a greater collision hazard. 5.4.2. The more sensitive habitat areas of the site should be avoided. A buffer area has been identified around all farm dams (of 100m) within which no PV panels or other above ground infrastructure should be built.	▪ Ensure that this is taken into consideration during the planning and design phase. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing	▪ Once-off ▪ Once during the design and planning phase	▪ Project Owner and Contractor ▪ Project Owner and Contractor
B. CONSTRUCTION PHASE					
5.5. Excessive loss of natural vegetation in and outside the development footprint area and veld degradation.	Minimise loss of natural vegetation. Prevent impacts on natural vegetation in sensitive habitats and SSC.	5.5.1. Sensitive habitats and areas outside of the project development area should be clearly demarcated as no go areas during the construction phase to avoid accidental impacts.	▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction. ▪ ECO must monitor activities and record and report non-compliance. Fines should be issued for non-compliance and the payment of fines should be specified in the contract of the construction workers and in the contract of the ECO. ▪ Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated ECO present to deal with any urgent issues.	▪ Daily	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		5.5.2. Ensure that the footprint required for the proposed project activities is kept at a minimum.	▪ Verify that the proposed project area is determined and outlined prior to the commencement of the construction phase by undertaking visual inspections.	▪ Once-off prior to construction and as required during the construction process.	▪ ECO
		5.5.3. The proposed project footprint must be demarcated to reduce unnecessary disturbance beyond the proposed project area.	▪ Carry out visual inspections to ensure strict control over the behaviour of staff in order to restrict activities to within demarcated areas.	▪ Weekly	▪ ECO
		5.5.4. The Contractors and construction personnel must be made aware that indigenous vegetation must not be removed or damaged.	▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor/ ECO ▪ ECO
		5.5.5. Ensure that the temporary site camp is established at least 32 m away from the banks of the drainage features.	▪ Monitor the placement of the site camp via visual inspections, and record and report any non-compliance.	▪ Once-off prior to construction and as required during the construction phase.	▪ ECO
		5.5.6. Unnecessary impacts on surrounding natural vegetation must be avoided during construction. All construction vehicles should remain on properly and clearly demarcated roads.	▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction. ▪ Include periodical site inspection in environmental performance	▪ Daily	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			reporting that specifically records occurrence of off-road vehicle tracks in specific areas.		
		5.5.7. Undertake rehabilitation of disturbed areas as soon as possible after construction. Stockpile the shallow topsoil layer separately from the subsoil layers. Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site during the pre-construction phase.	▪ Undertake audits following the construction phase and report any non-compliance.	▪ Monthly	▪ ECO and Contractor
		5.5.8. The collection, hunting or harvesting of any plants, fuel wood or animals at the site during construction should be strictly forbidden and the staff must be educated to prevent this from happening.	▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Daily ▪ Once-off training and ensure that all new staff are inducted. ▪ As needed	▪ ECO and Contractor ▪ Contractor/ ECO ▪ ECO
		5.5.9. Fires should only be allowed within fire-safe demarcated areas. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on site for the duration of the construction phase.	▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas. ▪ Ensure fire safety requirements are well understood and respected by	▪ Daily	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			workers (by providing basic fire safety training).		
		5.5.10. Existing access roads/servitudes must be used and should be located along the boundaries of existing disturbed areas, if possible.	▪ Compile plan pre-construction.	▪ Prior to construction commencing.	▪ Project Developer and ECO
5.6. Impact on indigenous vegetation, and on SSC and their habitats.	To reduce negative impacts on and loss of indigenous vegetation and protected trees. Minimise impacts on SSC and protected trees.	5.6.1. Appoint a specialist to undertake a second review and site visit of the final layout of the development footprint, in order to identify any plant species on site that may require “rescue” as well as any exotic weeds/vegetation that require removal.	▪ Appoint an Ecologist to oversee the final development footprint area through a reconnaissance survey.	▪ Prior to the commencement of construction.	▪ Project Owner, Specialist and ECO
		5.6.2. Identification of roadways and areas where extensive vegetation loss will result is required. Upon consideration, the avoidance of unnecessary clearance of vegetation on site should be undertaken through minor deviations to the design. 5.6.3. Ensure that the footprint required for the proposed project activities is kept at a minimum.	▪ Review how larger vegetation will be dealt with by contractors. ▪ Vegetation should be subject to redress when given a height that aligns with the lower limit of the PV array or when adjudged to affect construction.	▪ Ongoing	▪ ECO and Project Owner
		5.6.4. A plant rescue operation must be initiated to confirm that no other species are located within the development site.	▪ ECO must undertake a final walkthrough of the site prior to commencement of construction to ensure no SCC will be impacted on	▪ Once-off	▪ ECO and Contractor
		5.6.5. Clearing of vegetation should be kept to a minimum, keeping the width and length of	▪ Monitor activities and record and report non-compliance.	▪ Daily	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		the earthworks to a minimum.			
		5.6.6. Avoid the removal of listed SSC or protected species as far as possible. Should any of the listed/protected species need to be removed, the requisite permits must be obtained prior to the removal of the species.	▪ Monitor activities and record and report non-compliance.	▪ Daily	▪ ECO and Contractor
5.7. Disturbance of terrestrial fauna and flora on site due to construction workers and activities.	To advise construction staff of the requirements in respect of management of flora and fauna on site during the construction phase.	5.7.1. Conduct an Environmental Awareness Training and induction for all construction staff and personnel.	▪ Carry out Environmental Awareness Training with a discussion on the management of terrestrial fauna and flora on site. ▪ Conduct audits of the signed attendance registers.	▪ Prior to construction and as required by the ECO. Ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO
5.8. Impact on fauna as a result of construction activities.	To identify any faunal mortalities and record the details (such as the reason, spatial extent etc.) in order to avoid repetition of fatality.	5.8.1. Establish a recording method in order to monitor the construction activities, including species presence within site, mortalities and sightings.	▪ Establish database of species, sightings etc. ▪ Construction personnel should advise on the findings and presence of fauna on site.	▪ Daily to monthly	▪ ECO
	To remove species that may be found present in the construction footprint and laydown area.	5.8.2. Appoint a specialist to conduct an inspection of the final project area and sweep or inspect the site for any fauna, once the fencing is complete (i.e. the established site should be flushed to ensure any large wildlife is not contained within the fenced area). Appoint a	▪ Team to flush game as required. ▪ ECO to monitor flushing process and record any incidents or non-compliance.	▪ Once off prior to commencement and thereafter if required.	▪ ECO and Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		small team to flush game during the early evening. Game should be flushed by driving a team through the gated facility towards the exit.			
		5.8.3. The Contractor or Contractors Environmental Officer should monitor trenches at the start and end of each working day to check if any small animals are trapped.	▪ Monitor activities and record and report non-compliance.	▪ Daily and record as required during construction.	▪ ECO and Contractor
		5.8.4. No animals (including snakes) shall be killed on site. An expert or a suitable specialist should be appointed to remove and relocate any poisonous snakes during the construction phase.	▪ Monitor activities and record and report non-compliance. ▪ Ensure that the ECO receive the appropriate snake handling training.	▪ As required during construction.	▪ ECO and Contractor
5.9. Impacts on avifauna due to the construction of the solar facility.	Reduce impact on avifauna.	5.9.1. An extensive post construction monitoring programme is recommended for this site in order to document any impacts and provide the basis for an adaptive management approach to any impacts. 5.9.2. A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site.	▪ Compile and implement a monitoring plan, and record any findings. ▪ If any such sites are found case specific mitigation measures will need to be designed.	▪ Daily to monthly record keeping. ▪ Once-off prior to construction	▪ Project Owner and ECO ▪ ECO
5.10. Faunal and avifaunal road	Minimise loss of fauna as a	5.10.1. The construction personnel and staff should be made aware of the presence of fauna	▪ Carry out Environmental Awareness	▪ Once-off training and ensure that	▪ ECO and

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
mortality as a result of increased vehicles travelling to and within the site.	result of road mortalities.	within the proposed project area. The construction personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings.	Training. ▪ Conduct audits of the signed attendance registers.	all new staff are inducted. ▪ Monthly	Contractor ▪ ECO
		5.10.2. To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the site camp must be kept clean on a daily basis.	▪ Monitor the activities via visual inspections, and record and report any non-compliance.	▪ Daily	▪ ECO and Contractor
5.11. Impact and loss of fauna as a result of the fence line and exclusion of fauna from site resulting in ecological change within the site.	To reduce incidental mortality and injury of fauna within the construction area.	5.11.1. Ensure that the live electrical fence wire is not placed at ground level. 5.11.2. Conduct inspections of the fence line to address any animals that may be affected by the fence. 5.11.3. A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.	▪ Construct fence to ensure the live fence 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. ▪ Conduct a site specific avifaunal walk through.	▪ Daily to monthly record keeping. A register of all faunal sightings indicating date of siting; species affected; position of species (specific or indicative) and other observations should be established.	▪ Project Owner and Contractor ▪ ECO ▪ Ornithologist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
				▪ Once-off prior to construction.	
5.12. Increased ELP, leading to changes in nocturnal behavioural patterns amongst fauna.	The avoidance of electrical light pollution through prudent positioning of external lighting.	5.12.1. Placement of lighting, particularly security lighting, to avoid excessive influence on surrounding areas. Placement of lighting to be judiciously considered at time of implementation.	▪ Review lighting plans and identify important habitat zones to be avoided.	▪ Prior to the installation of lighting.	▪ Project Owner, Contractor and ECO
C. OPERATIONAL PHASE					
5.13. Vegetation management on site - consideration of redress methods of growth and habitat form around site.	Manage vegetation throughout the site to avoid conflict with operations of the proposed PV facility. Excessive growth of vegetation on site may affect operations of the PV facility, while excessive clearance of vegetation on site has concomitant impacts on the land in question. Management of vegetation at an optimum level of growth and height is required.	5.13.1. Identify protocol for pruning of vegetation and clearance where required. 5.13.2. Identify level of pruning and vegetation management required.	▪ Identify means of pruning and clearance of vegetation. For example, brushcutter, grazing etc.	▪ Ongoing and as required.	▪ Environmental Manager/ECO
5.14. Loss of SSC and their habitats.	Control loss of natural vegetation during the operational phase. Prevent impacts on natural	5.14.1. Unnecessary impacts on surrounding natural vegetation must be avoided. All operational and maintenance vehicles to remain on the roads and no driving off road allowed. No unauthorized persons should be allowed onto the site.	▪ Strict control over the behaviour of operation workers, restricting activities to within demarcated areas for operation. Strict control and proper education of staff to prevent misconduct.	▪ Ongoing and as required	▪ Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
	vegetation in sensitive habitats and SSC.	5.14.2. The collection, hunting or harvesting of any plants, any protected trees, fuel wood or animals at the site should be strictly forbidden and the staff educated to prevent this from happening. 5.14.3. Educate personnel and staff members about the biodiversity importance of the area by means of environmental awareness programmes. 5.14.4. Staff must remain within the boundaries of the PV facility at all times. The undeveloped portions of the site must be treated as conservation areas.	▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers. ▪ Issue fines for non-conformance as appropriate and as specified in the worker's contracts. ▪ Ensure that the awareness raising programmes are implemented.	▪ Daily ▪ Once-off training and ensure all new staff are inducted. ▪ As required ▪ As required during the operational phase.	▪ Facility Manager and Environmental Manager/ECO ▪ Facility Manager ▪ Environmental Manager/ECO
		5.14.5. All hazardous materials should be stored in the appropriate manner to prevent impacts on vegetation. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	▪ Monitor the activities via visual inspections, and record and report any non-compliance.	▪ Daily	▪ Environmental Manager/ECO
		5.14.6. Fires should only be allowed within fire-safe demarcated areas. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on site for the duration of the operational phase.	▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas. ▪ Ensure fire safety requirements are well understood and respected by workers (by providing basic fire safety training).	▪ Daily	▪ Facility Manager and Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		5.14.7. A storm-water management plan must be implemented during the operational phase. Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.	▪ Verify that the stormwater management plan is being implemented and signed off prior to the commencement of operations. ▪ Undertake regular inspections of the stormwater infrastructure (i.e. by implementing walk through inspections).	▪ Prior to commencement of operations. ▪ Weekly/Monthly	▪ Environmental Manager/ECO ▪ Facility Manager
		5.14.8. Undertake maintenance of rehabilitated areas in accordance with the rehabilitation and landscaping plan.	▪ Monitor topsoil removal and rehabilitation activities, and record and report non-compliance.	▪ Weekly or Monthly	▪ Facility Manager and Environmental Manager/ECO
		5.14.9. Continue with on-going monitoring programme to detect and quantify any alien species that may become established and identify the highly invasive species during the operation phase.	▪ Monitor the presence of alien invasive species on the development site.	▪ Reporting frequency depends on legal compliance framework	▪ Facility Manager and Environmental Manager/ECO
5.15. Impact and loss of fauna as a result of operational activities.	To reduce the loss of and impact on fauna.	5.15.1. Prior to the commencement of the operational phase, the plant manager and the landowner need to reach a decision in terms of the allowance of faunal activities or redress of faunal activities within site. 5.15.2. Identify points of excessive faunal activity and impact on operations. Undertake monitoring of faunal activities within the fenced area of the site and the immediate proximity of the site.	▪ Establish reporting procedure. ▪ Monitor the presence of fauna during the operational phase via visual inspections and site visits. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers. ▪ Issue fines for non-conformance as	▪ Daily ▪ Daily ▪ Once-off training and ensure all new staff are inducted. ▪ As required ▪ As required	▪ Facility Manager and Environmental Manager/ECO ▪ Facility Manager and Environmental Manager/ECO ▪ Facility Manager ▪ Environmental

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
	Reduce nesting of birds on the facility infrastructure during the operational phase.	5.15.3. Reduction in speed limits in and around site. 5.15.4. No hunting or trapping of animals. 5.15.5. The operational phase EMP must include provision for application to the provincial authority for permits for any necessary nest management.	appropriate and as specified in the worker's contracts. ▪ Nest relocation or removal should be done under permit from the provincial authority.		Manager/ECO ▪ Environmental Manager/ECO
5.16. Impact and loss of fauna as a result of the fence line and exclusion of fauna from site resulting in ecological change within the site.	To reduce the impact and loss of fauna from site as a result of their exclusion from the area.	5.16.1. Avoidance of damage to infrastructure by faunal activity as well as impact on fauna as a result of the site infrastructure. 5.16.2. Identify impact of burrowing and other faunal activities on the fence line and operations activities. 5.16.3. Undertake the management of faunal intrusion through the fence, including possible mortalities. 5.16.4. Provide critter paths through the fence line to allow species access to site. 5.16.5. Ensure that the live electrical fence wire is not placed at ground level. 5.16.6. Conduct inspections of the fence line to address any animals that may be affected by the fence. 5.16.7. Promote and support faunal presence and activities within the proposed PV facility.	▪ Identify where fauna may be affecting operations of site (burrows etc.) Consider redress if necessary. ▪ Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the fence. ▪ Monitor the activities via visual inspections, and record and report any non-compliance.	▪ Daily to monthly record keeping. ▪ A register of all faunal sitings indicating date of siting; species affected; position of species (specific or indicative) and other observations should be established. ▪ Daily	▪ Environmental Manager/ECO and Project Owner ▪ Environmental Manager/ECO and Project Owner ▪ Environmental Manager/ECO and Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
5.17. Impact of ELP around the site.	The avoidance of electrical light pollution through prudent positioning of external lighting.	5.17.1. Placement of lighting, particularly security lighting to avoid excessive influence on surrounding areas.	▪ Review lighting plans and identify important habitat zones to be avoided.	▪ Prior to the installation of lighting.	▪ Project Owner and Environmental Manager/ECO
5.18. Faunal and avifaunal road mortality as a result of increased vehicles travelling to and within the site.	Minimise loss of fauna as a result of road mortalities.	5.18.1. The operational personnel and staff should be made aware of the presence of fauna within the proposed project area. The operational personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings.	▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Facility Manager ▪ Environmental Manager/ECO
		5.18.2. To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the offices must be kept clean on a daily basis.	▪ Monitor the activities via visual inspections, and record and report any non-compliance.	▪ Daily	▪ ECO and Contractor
5.19. Impact on avifauna as a result of electrocution.	The reduction in the impact that electrical structures will have on avifauna within the area.	5.19.1. Mitigation is complex at electrical structures since there are many ways in which birds could get electrocuted as the hardware is complex and provides many different potential perches for birds. It is therefore recommended that mitigation be applied reactively once the facility is operational, only if a significant problem is detected.	▪ Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.	▪ As needed	▪ ECO and contractor
D. DECOMMISSIONING PHASE					

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
5.20. Rehabilitation of flora on site.	Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.	5.20.1. All damaged areas shall be rehabilitated upon completion of the contract. 5.20.2. All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. 5.20.3. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.	▪ Conduct a final external audit to confirm that area is rehabilitated to an acceptable level.	▪ Once off	▪ Project Owner with feedback and input from an appropriate specialist. with advice from specialist

6 OPEN SPACE MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. DESIGN PHASE					
6.1. Loss of vegetation and habitat fragmentation.	Keeping the area cleared of vegetation to a minimum.	6.1.1. Clearing of vegetation should be kept to a minimum and take into consideration the sensitivities on site shown in Appendices A and B of this EMPr.	▪ Ensure that solar panel/array design and layout is uniform and well-adapted to the surrounding environment and that no unnecessary areas are cleared of vegetation.	▪ Once-off during design	▪ Project Owner
6.2. Impacts due to establishment of alien invasive plants.	Ensure the appropriate removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	6.2.1. Ensure compliance with relevant Environmental Specifications for the control and removal of alien invasive plant species. 6.2.2. Appoint a specialist or contact relevant authorities to seek guidance on the removal of the alien vegetation on site. 6.2.3. Compile and finalise an alien weed eradication programme.	▪ Appoint a suitable specialist/ Contractor or contact the relevant authorities to seek guidance on the removal of the planted alien invasive species. ▪ Appoint a suitable specialist to compile an alien invasive vegetation eradication plan. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase. ▪ Once-off during the design phase. ▪ Once-off during the design phase.	▪ Project Owner ▪ Project Owner ▪ ECO
6.3. Permanent barriers to animal movement and habitat fragmentation.	The reduction in the impact that barrier will have on animal movement within the area.	6.3.1. Provide critter paths through the fence line to allow species access to site.	▪ Ensure that this is taken into consideration during the planning and design phase.	▪ Once-off during the planning and design phase	▪ Project Owner
		6.3.2. All remaining areas that are not impacted upon by the proposed development footprint should remain unfenced to allow for movement corridors between the	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the planning and design phase	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		remainder of the farm.			
B. CONSTRUCTION PHASE					
6.4. Permanent barriers to animal movement and habitat fragmentation.	The reduction in the impact that barrier will have on animal movement within the area.	6.4.1. Fencing should allow for the passage of small and medium sized mammals and all forms of mesh fencing should be avoided.	▪ This should be monitored by the ECO to determine whether this is effective.	▪ Daily	▪ ECO and Contractor
6.5. Loss of vegetation and habitat fragmentation.	Keeping the area cleared of vegetation to a minimum.	6.5.1. Clearing of vegetation should be kept to a minimum, keeping the width and length of the earthworks to a minimum.	▪ Monitor activities and record and report non-compliance.	▪ Daily	▪ ECO and Contractor
C. OPERATIONAL PHASE					
6.6. Increased risk of alien plant invasion.	Ensure that the site is kept free from alien invasive species.	6.6.1. Continuously monitor the site and remove alien invasive species that are found.	▪ Monitor the presence of alien invasive species on the development site.	▪ Reporting frequency depends on legal compliance framework	▪ Facility Manager and Environmental Manager/ECO
6.7. Increased animal road mortality.	Minimise loss of fauna as a result of road mortalities.	6.7.1. Create awareness during staff induction programmes. Staff must be made aware of the general speed limits as well as the potential animals that may cross and how to react in these situations.	▪ Conduct staff awareness training programmes.	▪ Once-off training and ensure all new staff are inducted.	▪ Facility Manager and Environmental Manager
		6.7.2. The relevant requirements and methodology for post construction bird monitoring in terms of the applicable and most recent Best practice Guideline at the time, e.g. "Birds and Solar Energy, Best	▪ Ensure that the relevant requirements for the post-construction bird monitoring in terms of the applicable Birds and Solar Energy Best Practice Guidelines are adhered to.	▪ As prescribed in the relevant Guidelines	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		Practice Guidelines" must be adhered to.			
		6.7.3. Any avian mortality or injury at the facility should be duly recorded and reported.	▪ Record any bird fatalities and undertake the necessary reporting to relevant authority.	▪ When required	▪ Project Owner
D. DECOMMISSIONING PHASE					
6.8. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.	To manage impacts on the surrounding environment during the operational phase.	6.8.1. Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level	▪ Once off	▪ Project Owner
		6.8.2. Stockpiled topsoil should be reapplied to disturbed areas and these areas should be re-vegetated using a mix of native species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape.	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level	▪ Once off	▪ Project Owner
		6.8.3. Edges of re-vegetated areas should be feathered to reduce form and line contrasts with surrounding undisturbed landscape.	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level	▪ Once off	▪ Project Owner

7 TRAFFIC MANAGEMENT PLAN INCLUDING TRANSPORTATION PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. DESIGN PHASE					
7.1. Increased traffic generation.	Manage impact that additional traffic generation will have on road network.	7.1.1. If abnormal loads need to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport.	▪ Ensure that the permits are applied for and obtained prior to commencement. ▪ Verify that this has been undertaken by reviewing approved permits.	▪ Once-off during the design phase ▪ Once-off during the design phase.	▪ Contractor ▪ ECO
		7.1.2. If the Transnet Service Road will be used as the designated access road to site, discussions must be held with Transnet Freight Rail prior to commencement to confirm requirements and details of the agreement.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase.	▪ Project Owner and ECO
		7.1.3. Ensure that the requirements for use of the Transnet Service Road are addressed and considered in the design, as and where applicable.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase.	▪ Project Owner and ECO
		7.1.4. If the Transnet Service Road will be used as the designated access road, the registration details of all vehicles that will make use of the road during the construction and operational phases must be provided to Transnet Freight Rail, in	▪ Ensure that the permits are applied for and obtained prior to commencement. ▪ Verify that this has been undertaken by reviewing approved permits.	▪ Once-off during the design phase ▪ Once-off during the design phase.	▪ Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		order to obtain official permits.			
		7.1.5. Provide a Transport Traffic Plan to SANRAL (if required).	▪ Ensure that the plan is compiled and submitted prior to commencement. ▪ Verify that this has been undertaken by reviewing approved plans.	▪ Once-off during the design phase ▪ Once-off during the design phase.	▪ Contractor ▪ ECO
7.2. Accelerated degradation of road structure due to construction and operational traffic.	Limit the deterioration of the road condition due to construction and operational traffic.	7.2.1. A Road Maintenance Plan should be developed for the section of the Transnet Service Road that will be used. The plan should address the requirements of Transnet Freight Rail, including but not limited to, grading, dust suppressant mechanisms, drainage, signage, and speed limits.	▪ Ensure that the plan is compiled and submitted prior to commencement. ▪ Verify that this has been undertaken by reviewing approved plans.	▪ Once-off during the design phase ▪ Once-off during the design phase.	▪ Contractor ▪ ECO
B. CONSTRUCTION PHASE					
7.3. Increased traffic generation during the construction phase resulting in a reduction of road based level of service	Reduce the amount of road based traffic during the construction phase.	7.3.1. Well maintained vehicles should be used together with well-trained drivers during the construction phase. Vehicle maintenance and driver competency should be monitored. Proof of driver competency as well as the vehicle checks should be verified and undertaken to ensure that vehicles are roadworthy and hence, do not pose a safety risk. The Contractors must ensure that construction vehicles are roadworthy,	▪ Carry out random checks of driver licences and conduct random visual inspections of construction vehicles for roadworthiness.	▪ Random visual inspection of vehicles weekly.	▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		properly serviced and maintained, and respect the vehicle safety standards implemented by the Project Owner.			
		7.3.2. During the construction phase, suitable parking areas should be designated for trucks and vehicles.	▪ Monitor the placement of the designated parking area for trucks and vehicles via visual inspections and record and report any non-compliance.	▪ Once-off prior to construction and as required during the construction phase.	▪ Project Owner and ECO
		7.3.3. The use of public transport (buses and/or minibus taxis) to convey construction personnel to the site should be encouraged If possible.	▪ Contractor may record arrival and departure times as well as number of workers using minibuses.	▪ Once a month on a randomly selected day.	▪ Contractor
		7.3.4. It is recommended that vehicles are not overloaded during the construction phase in order to reduce impacts on the road structures, particularly the access roads leading to the site. Random visual inspection of vehicles should be undertaken in order to monitor for overloading. The inspections should also verify if the trucks are covered with appropriate material (such as tarpaulin) if and where possible.	▪ Perform visual inspection of vehicles during the construction phase.	▪ Random visual inspection of vehicles weekly.	▪ Contractor
7.4. Increased level of road accidents (involving pedestrians, animals, other motorists on	Minimise the impact of the construction activities on the local traffic and avoid accidents with pedestrians, animals and	7.4.1. Well maintained vehicles should be used together with well-trained drivers during the construction phase. Vehicle maintenance and driver competency should be monitored. Proof of driver	▪ Carry out random checks of driver licences and conduct random visual inspections of construction vehicles for roadworthiness.	▪ Random visual inspection of vehicles weekly.	▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
the surrounding tarred/ gravel road network) due to increased traffic during construction.	other drivers on the surrounding tarred/ gravel roads. Reduce number of road accidents due to increased traffic during construction.	competency as well as the vehicle checks should be verified and undertaken to ensure that vehicles are roadworthy and hence, do not pose a safety risk. The Contractors must ensure that construction vehicles are roadworthy, properly serviced and maintained, and respect the vehicle safety standards implemented by the Project Owner.			
		7.4.2. Road kill monitoring programme (inclusive of wildlife collisions record keeping) should be established and fences should be installed, if needed, to direct animals to safe road crossings.	▪ Appropriate monitoring should be undertaken and fences installed, if needed to direct animals to safe road crossings.	▪ Weekly	▪ Contractor and ECO
		7.4.3. Adhere to all speed limits applicable to all roads used. All heavy load vehicles should maintain a speed limit of 40 km/hour in the proposed section of the Transnet Service Road.	▪ Ensure that speed limits are adhered to. ▪ Carry out random visual inspections to verify speed limits and general awareness of vehicle drivers.	▪ Daily ▪ Random during the construction phase.	▪ Contractor and ECO ▪ ECO
		7.4.4. Implement clear and visible signage and signals indicating movement of vehicles at the intersection with the Transnet Service Road to ensure safe entry and exit.	▪ Implement clear signalisation. ▪ Carry out random inspections to verify whether proper construction signage is being implemented.	▪ On-going ▪ Random during the construction phase	▪ Contractor and ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
7.5. Accelerated degradation of road structure due to construction traffic.	Limit the deterioration of the road condition due to construction traffic.	7.5.1. Construction activities will have a higher impact than the normal road activity and therefore the main access roads to site should be inspected on a weekly basis for structural damage.	▪ Ensure that the main access road to site maintains current condition through photographic surveys and monitoring.	▪ Weekly	▪ Contractor and ECO
		7.5.2. Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles.	▪ Ensure dust management measures are in place to adequately decrease the generation of dust.	▪ On-going	▪ Contractor and ECO
		7.5.3. It is recommended that vehicles are not overloaded during the construction phase in order to reduce impacts on the road structures, particularly the access roads leading to the site. Random visual inspection of vehicles should be undertaken in order to monitor for overloading. The inspections should also verify if the trucks are covered with appropriate material (such as tarpaulin) if and where possible.	▪ Perform visual inspection of vehicles during the construction phase.	▪ Random visual inspection of vehicles weekly.	▪ Contractor
		7.5.4. Make provision for the repairing of subgrade deterioration (i.e. pot holes, dust holes) that could possibly result due to loading of heavy construction vehicles on the Transnet Service Road.	▪ Make provision for repairs required to road	▪ Agree to with Transnet	▪ Contractor and ECO
7.6. Impact on air quality due to dust generation, noise and	Limit the release of noise, pollutants and dust	7.6.1. Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service	▪ Ensure dust management measures are in place to adequately decrease the	▪ On-going	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
exhaust emissions from construction vehicles and equipment.	emissions	Road, exposed areas and stockpiles.	generation of dust.		
		7.6.2. Construction vehicles must have their lights on at all times. Lights to be properly set to not blind train drivers who may then miss important signal, e.g stop signal (Signal Passed At Danger (SPAD).	▪ Ensure lights are on and properly set.	▪ On-going	▪ Contractor and ECO
		7.6.3. 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 dust management measures are in place to decrease the dust generated	▪ On-going	▪ Contractor and ECO
		7.6.4. Avoid using old and unmaintained construction equipment (which generate high sound levels) and ensure equipment is well maintained.	▪ Manage the air pollutants form construction vehicles through checking the condition of vehicles	▪ On-going	▪ Contractor and ECO
7.7. Soil contamination from leakage from battery (during transport and on-site construction).	Avoid soil contamination during transportation and construction of batteries on site.	7.7.1. The transport vehicle should be identified with symbols: the vehicle, must be correctly identified, following international conventions, symbols and colours, identifying the fact that corrosive and hazardous products are being transported.	▪ Check that trucks transporting batteries to site are appropriately identified with the required symbols.	▪ On-going	▪ Contractor and ECO
		7.7.2. PPE should be provided for the transport team and they should be trained in the use of the equipment, in case of any accident.	▪ Provide PPE to transport team.	▪ On-going	▪ Contractor and ECO
		7.7.3. Drivers and personnel on site dealing with	▪ Ensure that drivers and personnel	▪ Monthly	▪ Contractor and

Impact	Mitigation/Management Objectives	Mitigation/Management Actions		Monitoring		
				Methodology	*Frequency*	*Responsibility*
			the battery storage's hazardous wastes should always be trained in emergency procedures, including explosions, fire, spilling, etc. and how to contact emergency response teams. Besides this, they should be aware of the specific kind of hazardous material is being transported and how to deal with it	are trained in handling the battery.		ECO
C. OPERATIONAL PHASE						
7.8. Increased level of road accidents (involving pedestrians, animals, other motorists on the surrounding tarred/ gravel road network) due to increased traffic during the operational phase.	Minimise the impact of the operational activities on the local traffic and avoid accidents with pedestrians, animals and other drivers on the surrounding tarred/ gravel roads. Reduce number of road accidents due to increased traffic during the operational phase.	7.8.1.	Well maintained vehicles should be used together with well-trained drivers during the operational phase, as required. Vehicle maintenance and driver competency should be monitored. Proof of driver competency as well as the vehicle checks should be verified and undertaken to ensure that vehicles are roadworthy and hence, do not pose a safety risk. Vehicles must be roadworthy, properly serviced and maintained.	▪ Carry out random checks of driver licences and conduct random visual inspections of vehicles for roadworthiness.	▪ Random visual inspection of vehicles weekly.	▪ Facility Manager
		7.8.2.	Adhere to all speed limits applicable to all roads used. All heavy load vehicles should maintain a speed limit of 40 km/hour in the proposed section of the Transnet Service Road.	▪ Ensure that speed limits are adhered to. ▪ Carry out random visual inspections to verify speed limits and general awareness of vehicle drivers.	▪ Daily ▪ Random during the operational phase.	▪ Facility Manager ▪ Facility Manager
		7.8.3.	Implement clear and visible signage and signals indicating movement of vehicles at the intersection with the Transnet Service	▪ Implement clear signalisation. ▪ Carry out random inspections to	▪ Ongoing ▪ Random during	▪ Facility Manager

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		Road to ensure safe entry and exit.	verify whether proper construction signage is being implemented.	the operational phase.	▪ Facility Manager
		7.8.4. The use of public transport (buses and/or minibus taxis) or carpooling to convey operational personnel to the site should be encouraged.	▪ Monitor the requirements	▪ On-going	▪ Facility Manager
		7.8.5. Adhere to requirements made within Transport Traffic Plan.	▪ Monitor the requirements as set out in the Plan as ensure that it is adhered to	▪ On-going	▪ Facility Manager
		7.8.6. Limit access to the site to personnel.	▪ Maintain a register of visitors and staff that enter site and restrict access to personnel.	▪ On-going	▪ Facility Manager
7.9. Accelerated degradation of road structure due to operational traffic.	Limit the deterioration of the road condition due to operational phase traffic.	7.9.1. The main access roads to site should be inspected on a weekly basis for structural damage.	▪ Ensure that the main access road to site maintains current condition through photographic surveys and monitoring.	▪ Weekly	▪ Facility Manager
		7.9.2. Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles.	▪ Ensure dust management measures are in place to adequately decrease the generation of dust.	▪ On-going	▪ Facility Manager
		7.9.3. It is recommended that vehicles are not overloaded during the operational phase (where applicable) in order to reduce impacts on the road structures, particularly the access roads leading to the site. Random visual inspection of	▪ Perform visual inspection of vehicles during the construction phase.	▪ Random visual inspection of vehicles weekly.	▪ Facility Manager

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		vehicles should be undertaken in order to monitor for overloading (where applicable).			
		7.9.4. Make provision for the repairing of subgrade deterioration (i.e. pot holes, dust holes) that could possibly result due to overloading of vehicles (where applicable) on the Transnet Service Road.	▪ Make provision for repairs required to road.	▪ Agree to with Transnet	▪ Project Owner
		7.9.5. Implement requirements of the Road Maintenance Plan.	▪ Adhere to requirements of the Road Maintenance Plan.	▪ On-going	▪ Facility Manager
D. DECOMMISSIONING PHASE					
7.10. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.					

8 STORM WATER MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. DESIGN PHASE					
1. Impact of the project if a detailed storm water management plan is not correctly prepared and implemented.	To limit the effect of uncontrolled storm water run-off from developed areas onto natural areas.	1.1. Prepare a detailed stormwater management plan outlining appropriate treatment measures to address runoff from disturbed portions of the site, such that they do not: ▪ result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural water courses; ▪ result in any necessity for concrete or other lining of natural water courses to protect them from concentrated flows of the development; ▪ divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.	▪ Check compliance with specified conditions. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during design followed by regular control. ▪ During the design phase.	▪ Contractor ▪ ECO
B. CONSTRUCTION PHASE					
2. Diversion and impedance surface	Prevent interference with natural run-off patterns,	2.1. The appointed Contractor should compile a Method Statement for Stormwater	▪ Compile a Method Statement for Stormwater Management during	▪ Prior to the construction phase.	▪ Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
water flows – Changes to the hydrological regime and increased potential for erosion. Diversion and increased velocity of surface water flows – reduction in permeable surfaces.	diverting flows and increasing the velocity of surface water flows.	Management during the construction phase.	the construction phase. ▪ Inspect and verify if a Method Statement for Stormwater Management has been compiled by the Contractor via audits prior to the commencement of the construction phase.	▪ Once-off prior to the commencement of the construction phase.	
		2.2. Stormwater and any run-off generated by the hard surfaces should be discharged into retention swales or areas with rock rip-rap (or similar). These could be used to enhance the sense of place, if they are planted with indigenous vegetation.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or bi-weekly	▪ ECO
		2.3. Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses or similar) and the re-vegetation of any disturbed riverbanks.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or Bi-weekly	▪ ECO
		2.4. Place energy dissipation structures in a manner that allows the management of flows prior to being discharged into the natural environment, thus not only preventing erosion, but supporting the maintenance of natural base flows within these systems i.e. hydrological regime (water quantity and quality) is maintained.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or bi-weekly	▪ ECO
		2.5. Reinforce soil slopes to minimise erosion during rehabilitation (as needed, and once construction in a specific area has been	▪ Monitor activities and record and report non-compliance.	▪ As needed during the construction	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		completed).		phase.	
		2.6. Any irrigation of the development area for landscaping or dust control purposes should be controlled, such that it does not result in any measurable increase in moisture being passed into natural drainage lines.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or bi-weekly	▪ ECO
		2.7. Drainage along the sides of the roads should be designed so that it does not result in concentrated flows into watercourses.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or bi-weekly	▪ ECO
		2.8. Perform periodic inspections and maintenance of soil erosion measures and stormwater control structures.	▪ Monitor activities and record and report non-compliance.	▪ As needed during the construction phase.	▪ ECO
3. Pollution of the surrounding environment as a result of the contamination of stormwater. Contamination could result from the spillage of chemicals, oils, fuels, sewage, solid waste, litter etc.	To prevent contaminated stormwater from entering into and adversely impacting on freshwater ecosystems and reducing the water quality. To reduce sedimentation of nearby water systems. To apply best practice principles in managing risks to storm water pollution.	3.1. The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase.	▪ Compile a Method Statement for Stormwater Management during the construction phase. ▪ Inspect and verify if a Method Statement for Stormwater Management has been compiled by the Contractor via audits prior to the commencement of the construction phase.	▪ Prior to the construction phase. ▪ Once-off prior to the commencement of the construction phase.	▪ Contractor ▪ ECO
		3.2. Provide secure storage for fuel, oil, chemicals and other waste materials to prevent contamination of stormwater runoff. Fuels and chemicals (i.e. any hazardous materials and dangerous goods) used during the construction phase must be	▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. Monitor if spillages have taken	▪ Weekly	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		stored safely on site and in bunded areas. Fuel and chemical storage containers must be inspected to ensure that any leaks are detected early.	place and if they are removed correctly.		
		3.3. All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into water bodies must be minimised through effective stabilisation. No stockpiling should take place within a watercourse. 3.4. Stockpiles must be located away from river channels i.e. greater than 32 m.	▪ Monitor the excavations and stockpiling process throughout the construction phase via visual site inspections. Record non-compliance and incidents.	▪ Daily	▪ ECO
		3.5. Littering and contamination of water resources during construction must be prevented by effective construction camp management.	▪ Monitor via site audits and record non-compliance and incidents (i.e. by implementing walk through inspections).	▪ Weekly	▪ Contractor and ECO
		3.6. Emergency plans must be in place to deal with potential spillages (especially those leading to any watercourses).	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or Bi-weekly	▪ ECO
		3.7. Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses or similar) and the re-vegetation of any disturbed riverbanks.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or Bi-weekly	▪ ECO
		3.8. Ensure that the temporary site camp and ablution facilities are established at least 32	▪ Monitor the placement of the site camp via visual inspections, and	▪ Once-off prior to construction and as	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		m away from the banks of drainage lines.	record and report any non-compliance.	required during the construction phase.	
		3.9. Ensure that there is no ad-hoc crossing of channels by vehicles during the construction phase. Access routes across the site should be strictly demarcated and selected with a view to minimise impacts on drainage lines.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or Bi-weekly	▪ ECO
		3.10. Ensure that no waste materials or sediments are left in the surrounding drainage lines (as a result of the construction).	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement.	▪ Weekly or Bi-weekly	▪ ECO
		3.11. Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.	▪ Monitor via site audits and record non-compliance and incidents (i.e. by implementing walk through inspections).	▪ Weekly	▪ Contractor and ECO
C. OPERATIONAL PHASE					
4. Stormwater discharge into the surrounding environment during operations.	To minimise the contamination of stormwater by uncontrolled release of contaminated or grey water. To protect soil resources and prevent soil erosion.	4.1. An operational phase Stormwater Management Plan should be designed and implemented, with a view to prevent the passage of concentrated flows from hardened surfaces and onto natural areas.	▪ Compile a Stormwater Management Plan for the operational phase. ▪ Inspect and verify if a Stormwater Management Plan has been compiled prior to the commencement of the operational phase.	▪ Continuously during operational phase. ▪ Once-off prior to the commencement of the operational phase.	▪ Project Owner
		4.2. All release points into the natural environment must have appropriate energy	▪ Monitor activities and record and	▪ On-going	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		dissipaters to minimise scouring/erosion.	report non-compliance. ▪ Monitor the placement of energy dissipaters via visual inspections, and record and report any non-compliance.		
		4.3. Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.	▪ Undertake regular inspections of the stormwater infrastructure (i.e. by implementing walk through inspections).	▪ Weekly/Monthly	▪ ECO and O&M team
D. DECOMMISSIONING PHASE					
5. The proposed solar facility would be expected to run for a minimum period of 20 years, after which it would either be decommissioned, alternatively upgraded or an application submitted to obtain a new license. Should the plant be decommissioned, the solar field would be rehabilitated to its original (pre-development) state. In the (unlikely) event that none of the mitigation measures outlined for the construction and operational phases of the proposed project had been implemented, the period of time for recovery to take place would be extended. In the event that decommissioning occurs, and assuming implementation of mitigation measures, the hydrological regime should fully recover over time to present day conditions.					

9 EROSION MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. CONSTRUCTION PHASE					
9.1. Increased wind erosion and resultant deposition of dust.	Prevent wind erosion and resultant deposition of dust on surrounding indigenous vegetation.	9.1.1. Sand, stone and cement should be stored in demarcated areas, and covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation.	▪ Undertake regular inspections of the via site audits to verify that sand, stone and cement are stored and handled as instructed.	▪ Daily	▪ ECO and Contractor
		9.1.2. During construction, efforts should be made to retain as much natural vegetation as possible on the site, to reduce disturbed areas and maintain plant cover, thus reducing erosion risks.	▪ Monitor activities via site inspections and record and report non-compliance.	▪ Daily	▪ ECO and Contractor
		9.1.3. All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into water bodies must be minimised through effective stabilisation.	▪ Monitor the stockpiling process throughout the construction phase via visual site inspections. Record non-compliance and incidents.	▪ Daily	▪ ECO
9.2. Excessive loss of natural vegetation within the development footprint area.	Prevent loss of natural vegetation through erosion.	9.2.1. Vegetation clearing during construction must be restricted to the footprint of the proposed project components and planned infrastructure only. It should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.	▪ Monitor vegetation clearing throughout the construction phase via visual site inspections. Record non-compliance and incidents. ▪ Undertake regular monitoring for erosion to ensure is reduced and	▪ Daily ▪ Daily	▪ ECO and Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
			rectified as soon as possible.		
		9.2.2. Stockpile the shallow topsoil layer separately from the subsoil layers (especially if the excavation exceeds 0.5 m). Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas.	▪ Rehabilitate disturbed areas and monitor the presence of alien invasive species on site.	▪ Daily (stockpiling) and once-off for the reinstatement of the top soil layer	▪ ECO and Contractor
		9.2.3. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	▪ Re-seed with seeds of indigenous grass species.	▪ Once off	▪ ECO with advice from specialist (if required)
		9.2.4. Topsoil stockpiles not used in three months after stripping must be seeded to prevent dust and erosion.	▪ Regular monitoring for erosion to ensure that no erosion problems are occurring at the site. All erosion problems observed should be rectified as soon as possible.	▪ Weekly initially and thereafter monthly	▪ ECO and Contractor
9.3. Erosion of surface soils, rilling and gulleys due to water erosion.	Measures to be implemented that address or avoid the loss of surface soils and exacerbates gulley formation.	9.3.1. Identify cause of erosion and possible means of redress (i.e. implement erosion control measures, where applicable), such as the use of geofabric, stone gabions and re-vegetation or similar measures. 9.3.2. Erosion control measures should seek to	▪ Monitor the erosion on site during construction, as well as the implementation and effectiveness of erosion control on site (such as the use of geofabric, stone gabions and re-vegetation or similar measures).	▪ Ongoing and as required during erosion events.	▪ ECO and Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		reduce surface flow velocity and allow for settlement on site of silt laden surface waters. Washaways, excessive loss of soils and gulleys can be considered to be indicative of excessive erosion.			
B. OPERATIONAL PHASE					
9.4. Excessive loss of natural vegetation in the development footprint area and resulting impacts on SSC, faunal habitat and habitat fragmentation.	Prevent loss of natural vegetation and minimise habitat fragmentation and the loss of connectivity as a result of erosion.	9.4.1. To prevent erosion, indigenous grasses that seed themselves below the solar arrays should (where possible) be left to form a ground cover and kept short.	▪ ECO to advise on seed to be used.	▪ Prior to re-vegetation.	▪ Project Owner
		9.4.2. The use of silt fences, sand bags or other suitable methods must be implemented in areas that are susceptible to erosion. Other erosion control measures that can be implemented are as follows: 1) Brush packing with cleared vegetation, 2) Planting of vegetation, 3) Hydro seeding/hand sowing. All erosion control mechanisms need to be regularly maintained.	▪ Monitor efficiency of erosion control measures.	▪ Weekly or monthly	▪ Project Owner
		9.4.3. Conduct regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. Ensure that all erosion problems are rectified as soon as possible.	▪ Undertake regular monitoring for erosion to ensure is reduced and rectified as soon as possible.	▪ Monthly	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
9.5. Increased water erosion as a result of run-off water from hardened surfaces.	Manage run-off water to prevent down slope water erosion.	9.5.1. Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	▪ Include periodic site inspections in environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records occurrence or non-occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	▪ Monthly	▪ Project Owner
C. DECOMMISSIONING PHASE					
9.6. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. Monitoring: Final external audit of area to confirm that area is rehabilitated to an acceptable level (once off event to be conducted by ECO).					

10 HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. CONSTRUCTION PHASE					
10.1. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of concrete and cement.	To control concrete and cement batching activities in order to reduce spillages and resulting contamination of soil, groundwater and the vegetation and/or fauna.	10.1.1. If any concrete mixing takes placed on site, this must be carried out in a clearly marked, designated area at the site camp on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface).	▪ Monitor the handling and storage of sand, stone and cement as instructed.	▪ Daily	▪ Project Owner, Contractor and ECO
		10.1.2. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains.	▪ Monitor the handling and storage of sand, stone and cement as instructed.	▪ Daily	▪ Project Owner, Contractor and ECO
		10.1.3. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted.	▪ Monitor the handling and storage of sand, stone and cement as instructed.	▪ Daily	▪ Project Owner, Contractor and ECO
		10.1.4. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licensed disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Daily ▪ Monthly	▪ Project Owner, Contractor and ECO ▪ ECO
		10.1.5. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Empty cement bags	▪ Monitor the handling and storage of sand, stone and cement as instructed.	▪ Daily	▪ Project Owner, Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		must be collected from the construction area at the end of every day. Sand and aggregates containing cement must be kept damp to prevent the generation of dust.			
		10.1.6. Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed at a licensed waste disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Daily ▪ Monthly	▪ Project Owner, Contractor and ECO ▪ ECO
10.2. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils.	To control and eliminate fuel and oil spillages which may result in soil contamination and damage to vegetation and/or fauna.	10.2.1. Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the site camp. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel).	▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.	▪ Weekly	▪ Contractor and ECO
		10.2.2. Monitor and inspect construction equipment and vehicles to ensure that no fuel spillage takes place. Ensure that drip trays are provided for construction equipment and vehicles as required.	▪ Monitor the construction equipment and vehicles and monitor the occurrence of spills and the management process thereof.	▪ Daily ▪ During spill events	▪ Contractor and ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			▪ Record all spills and lessons learnt.		
		10.2.3. Contractor to compile a Method Statement for refuelling activities under normal and emergency situations. If on-site servicing and refuelling is required in emergency situations, a designated area must be created at the construction site camp for this purpose. Drip trays or similar impervious materials must be used during these procedures.	▪ Verify if a Method Statement is compiled by reviewing approved and signed off reports. ▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages.	▪ Once-off prior to commenceme nt of construction. ▪ During emergency refuelling and servicing activities.	▪ ECO ▪ ECO
		10.2.4. Spilled fuel, oil or grease must be retrieved and contaminated soil removed, cleaned and replaced.	▪ Monitor the handling and storage of fuels and oils via site audits and monitor if spillages have taken place and if so, are removed correctly. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Daily (or during spills)	▪ Contractor and ECO
		10.2.5. Contaminated soil to be collected by the Contractor (under observation of the ECO) and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	▪ Monitor the correct removal of contaminated soil. Monitor waste disposal slips and waybills via site audits and record non-compliance and	▪ Daily (or during spills)	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			incidents.		
		10.2.6. A Spill Response Method Statement must be compiled by the Contractor for the construction phase in order to manage potential spill events.	▪ Compile a Spill Response Method Statement. ▪ Audit signed and approved Spill Response Method Statement.	▪ Once-off (and thereafter updated as required during the construction phase). ▪ Once-off (and thereafter as required during the construction phase).	▪ Contractor and Project Owner ▪ ECO
		10.2.7. The Contractor must ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events.	▪ Monitor via site audits and record incidents and non-compliance.	▪ Daily/Weekly	▪ ECO and Contractor
		10.2.8. Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.	▪ Ensure that a well-maintained portable bioremediation kit is available on site and that construction personnel and contractors are aware of its location and instructions	▪ Daily	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		10.2.9. In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is considered to be significantly contaminated, a specialist will need to be immediately appointed to address the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e. GN 331). If the soil is determined to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Environmental Affairs of the significant contamination.	▪ Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e. GN 331) in order to determine if the soil is significantly contaminated or not. ▪ If the contaminated soil is considered to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant.	▪ During spill events	▪ Project Owner
		10.2.10. The Contractor must record and document all significant spill events.	▪ Monitor documentation and records of significant spill events via audits and record non-compliance and incidents.	▪ During spill events	▪ ECO
10.3. Soil contamination from leakage from battery (during transport and on-site construction).	Avoid soil contamination during transport and construction of battery storage facility.	10.3.1. Batteries must be transported inside containers.	▪ Check that this is undertaken.	▪ During transport of batteries	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		10.3.2. Containers must be well packed to the transport vehicle.	▪ Check that this is undertaken.	▪ During transport of batteries	▪ Contractor and ECO
		10.3.3. A minimum set of equipment necessary to combat any simple spillage or leakage problems should be provided and the transport team trained on how to use it.	▪ Ensure that transport team know how to manage spills.	▪ During transport of batteries	▪ Contractor and ECO
		10.3.4. The construction of the facility should adhere to the appropriate international standards and South African National Standards (SANS) requirements and should be located on an impermeable barrier/layer (e.g. concrete surface with acid lining).	▪ Ensure that the facility adheres to the relevant SANS and international requirements.	▪ Ongoing	▪ Contractor and ECO
		10.3.5. Secondary containment may need to be constructed and must have a capacity of at least 110% of the largest storage tank's capacity. The secondary containment should include the following: ▪ The off-loading point must be located in the bunded area to ensure that any potential spill during the off-loading of the electrolyte solutions is contained; ▪ Divert rainwater away from the bunded area to avoid rainwater mixing with electrolyte spillage potentially present within the secondary containment; ▪ Ensure that the containment area is	▪ Provide secondary containment according to the specifications.	▪ On-going	▪ Contractor and ECO

Impact	**Mitigation/Management Objectives**	**Mitigation/Management Actions**	**Monitoring**		
			Methodology	***Frequency***	***Responsibility***
		sloped to a sump; and ▪ All drains should be covered.			
		10.3.6. Although highly unlikely, any spill/leakage from the battery storage facility must be attended to immediately and be handled in an environmental friendly manner (i.e. no discharge into the ground or any surface water body) and must be disposed of at an appropriate licenced hazardous waste disposal facility.	▪ Immediately attend to any spillage.	▪ On-going	▪ Contractor and ECO
B. OPERATIONAL PHASE					
10.4. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils	To control and eliminate fuel and oil spillages which may result in soil contamination and damage to vegetation and/or fauna.	10.4.1. Monitor and inspect maintenance equipment and vehicles to ensure that no fuel spillage takes place.	▪ Implement specifications for maintenance equipment use as specified by the maintenance Contractor.	▪ Monthly	▪ Project Owner
		10.4.2. Spilled fuel, oil or grease is retrieved during operations where possible and contaminated soil removed, cleaned and replaced.	▪ Monitor the handling and storage of fuels and oils via site audits and monitor if spillages have taken place and if so, are removed correctly. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ During spills	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		10.4.3. Contaminated soil to be collected by the Contractor and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	▪ Monitor the correct removal of contaminated soil. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ During spills	▪ Project Owner
		10.4.4. A Spill Response Plan must be compiled for the operational phase in order to manage potential spill events.	▪ Compile a Spill Response Plan. ▪ Audit signed and approved Spill Response Method Statement.	▪ Once-off (and thereafter updated as required). ▪ Once-off (and thereafter as required).	▪ Project Owner ▪ Facility Manager
		10.4.5. Ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events. Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.	▪ Ensure that a well-maintained portable bioremediation kit is available on site and that operational personnel are aware of its location and instructions.	▪ Weekly	▪ Facility Manager
		10.4.6. In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is considered to be significantly contaminated, a specialist will need to be immediately appointed to address	▪ Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e. GN 331) in order to determine if the	▪ During spill events	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e. GN 331). If the soil is determined to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Environmental Affairs of the significant contamination. 331).	soil is significantly contaminated or not. ▪ If the contaminated soil is considered to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant.		
		10.4.7. Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the PV facility. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel).	▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.	▪ Weekly	▪ Facility Manager
10.5. Impacts due to management of solid and liquid wastes disposed of on the site during operational phase.	Prevent environmental impacts as a result of the operational phase such as pollution.	10.5.1. All operation waste to be removed from the site by an appointed service provider.	▪ Waste removal and disposal to be monitored throughout operation.	▪ Monthly	▪ Facility Manager
		10.5.2. All liquid waste or spills (used oil, paints, lubricating compounds and grease from vehicles passing through the entrance facility) to be packaged and disposed appropriately at a	▪ Monitor the correct removal of liquid waste or spills. Monitor waste disposal slips and waybills	▪ During spills	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		registered landfill site.	via site audits and record non-compliance and incidents.		
		10.5.3. Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided in order to avoid spillages.	▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.	▪ Weekly	▪ Facility Manager
C. DECOMMISSIONING PHASE					
10.6. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.					

11 ENVIRONMENTAL AWARENESS AND FIRE MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. DESIGN PHASE					
11.1. Potential impacts resulting from the lack of overall compliance with the conditions of the EA (issued by the DEA)	Ensure compliance with all environmental conditions of approval (issued by DEA as part of the EA).	11.1.1. Establish clear and transparent reporting of the activities undertaken with regard to all recommendations included in the EMPr.	▪ Audit report on compliance with actions and monitoring requirements.	▪ Based on EA conditions	▪ Project Owner and ECO
		11.1.2. Audit the implementation of the EMPr requirements.	▪ Audit report on compliance with actions and monitoring requirements.	▪ Weekly	▪ ECO
11.2. Risk of fire, explosion or release of toxic gas.	Reduce fire, explosion or release of toxic gas risk from battery storage facility.	11.2.1. The battery storage facility must be located outside (i.e. well-ventilated) and include vents (where necessary and applicable).	▪ Ensure compliance to this requirement.	▪ Once-off	▪ Project Owner
B. CONSTRUCTION PHASE					
11.3. Potential risk of fire due to construction activities or behaviour of staff on site during the construction phase.	Prevent fire on site resulting from workers smoking or starting fires (i.e. cooking, heating purposes).	11.3.1. Designate smoking areas, as well as areas for cooking, where the fire hazard could be regarded as insignificant.	▪ Ad-hoc checks to ensure workers are smoking or cooking in designated areas only.	▪ Daily	▪ ECO and Contractor
		11.3.2. Educate workers on the dangers of open and/or unattended fires.	▪ Ensure fire safety requirements are well understood and respected by construction personnel. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed	▪ Ongoing. ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ Contractor/ ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
			attendance registers.		
		11.3.3. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the construction phase.	▪ Ensure fire safety requirements are well understood and respected by construction personnel. Provide basic fire safety training.	▪ On-going	▪ ECO and Contractor
		11.3.4. Ensure that cooking takes place in a designated area shown on the site map. Ensure that no firewood or kindling may be gathered from the site or surrounds.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary.	▪ On-going	▪ ECO and Contractors
		11.3.5. Fire-fighting equipment must be made available at various appropriate locations on the construction site.	▪ Ensure fire safety requirements are well understood and respected by workers. ▪ Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company.	▪ On-going ▪ Bi-annually	▪ ECO and Contractor ▪ Contractor
11.4. Inappropriate behaviour of civil contractors and sub-contractors during the construction phase	Prevent unnecessary impacts on the surrounding environment by ensuring that contractors are aware of the requirements of the EMPr. Ensure that contractors and sub-contractors do	11.4.1. Ensure that the EMPr and the EA (should it be granted by the DEA), are included in all tender documentation and contractors and sub-contractors contracts.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary.	▪ On-going	▪ ECO and Contractors
		11.4.2. Contractors and sub-contractors must use the ablution facilities situated in a designated area within the site; and no bathing/washing should be permitted outside the designated area.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary.	▪ On-going	▪ ECO and Contractors

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
	not induce impacts on the surrounding environment as a result of unplanned pollution on site.	11.4.3. All litter will be deposited in a clearly labelled, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary.	▪ On-going	▪ ECO and Contractors
	Ensure that actions by on-site contractors and sub-contractors and workers are properly managed in order to minimise impacts to surrounding environment	11.4.4. No person other than a qualified specialist or personnel authorised by the Project Owner, will disturb or remove plants outside the demarcated construction area.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary.	▪ On-going	▪ ECO and Contractors
		11.4.5. No person other than a qualified specialist or personnel authorised by the Project Owner, will disturb animals on the site.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary.	▪ On-going	▪ ECO and Contractors
		11.4.6. Educate workers on site about suitable behaviour on site and initiate environmental awareness. Staff must be informed that no trapping, snaring or feeding of any animal will be allowed.	▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor/ ECO ▪ ECO
11.5. Inappropriate planning and of site camp establishment.	Ensure that environmental issues are taken into consideration in the planning for site establishment.	11.5.1. All construction activities, materials, equipment and personnel must be restricted to the actual construction area specified (as required to undertake the construction work). The construction area must be demarcated by the Contractor.	▪ Monitor compliance and record non-compliance and incidents.	▪ Before construction	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		11.5.2. The Contractor should install and maintain Construction Site Information Boards in the position, quantity, design and dimensions specified by the Project Owner.	▪ Monitor compliance and record non-compliance and incidents.	▪ Before construction	▪ ECO
		11.5.3. General building materials should be stored in appropriate designated areas on site such that there will be no runoff from these areas towards sensitive systems. The site camp must be removed after construction.	▪ Monitor compliance and record non-compliance and incidents.	▪ Before construction	▪ ECO
11.6. Increased animal road mortality.	Reduction in animal mortality	11.6.1. The construction staff should be made aware of the presence of fauna and within the proposed project area. The construction personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings, and should be trained on how to react in these situations.	▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor/ ECO ▪ ECO
		11.6.2. To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the site camp must be kept clean on a daily basis.	▪ Monitor the activities via visual inspections, and record and report any non-compliance.	▪ Daily	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		11.6.3. Establish a monitoring programme to record the number of faunal road mortalities and collisions. If it is established that the number of collisions and faunal fatalities increase within an area, particularly with regards to smaller species (reptiles), then measures such as exclusion fences within these areas only should be installed.	▪ Appropriate monitoring and recording should be undertaken. ▪ Exclusion fences should be installed, if needed to direct animals to safe road crossings.	▪ Weekly ▪ As required	▪ ECO ▪ ECO and Contractor
11.7. Increased energy consumption during the construction phase.	Reduce energy consumption where possible.	11.7.1. Encourage the use of energy saving equipment at the site camp site (such as low voltage lights and low pressure taps) and promote recycling. Construction personnel must be made aware of energy conservation practices as part of the Environmental Awareness Training programme.	▪ Contractor to monitor energy usage via audits. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Monthly ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor ▪ Contractor/ ECO ▪ ECO
11.8. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during the construction phase.	11.8.1. Water conservation should be practiced as follows: ▪ Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g. sweep before wash-down). ▪ Ensure that regular audits of water systems are conducted to identify possible water leakages. 11.8.2. Avoid the use of potable water for dust suppression during the construction phase and consider the use of	▪ Monitor via site audits and record non-compliance and incidents.	▪ Monthly	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		alternative approved sources, where possible.			
		11.8.3. Make construction personnel aware of the importance of limiting water wastage, as well as reducing water use.	▪ Carry out Environmental Awareness Training with a discussion on water usage and conservation. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor/ ECO ▪ ECO
C. OPERATIONAL PHASE					
11.9. Potential risk of fire due to behaviour of staff on site during the operational phase	Ensure appropriate and efficient fire prevention during the operational phase.	11.9.1. Designate smoking areas as well as areas for cooking, where the fire hazard could be regarded as insignificant.	▪ Random inspections during a month to ensure workers are smoking or starting fires in designated areas only.	▪ Monthly	▪ Facility Manager
		11.9.2. Educate workers on the dangers of open and/or unattended fires.	▪ Ensure fire safety requirements are well understood and respected by operational personnel. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Ongoing ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Facility Manager ▪ Facility Manager ▪ Facility Manager
		11.9.3. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the operational phase.	▪ Ensure fire safety requirements are well understood and respected by operational personnel. Provide basic fire safety training.	▪ On-going	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		11.9.4. Ensure that adequate fire-fighting equipment is available and easily accessible on site.	▪ Ensure fire safety requirements are well understood and respected by workers. ▪ Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company.	▪ On-going ▪ Bi-annually	▪ Facility Manager ▪ Project Owner
11.10. Increased energy consumption during the operational phase.	Reduce energy consumption where possible.	11.10.1. Encourage the use of energy saving equipment at the PV facility (such as low voltage lights and low pressure taps) and promote recycling. Operational personnel must be made aware of energy conservation practices as part of the environmental awareness training programme.	▪ Monitor energy usage via site investigations. ▪ Conduct training for all operational personnel.	▪ Monthly ▪ As and when required and ensure that all new staff are inducted.	▪ Facility Manager ▪ Project Owner
11.11. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during operations.	11.11.1. Water conservation to be practiced in line with Energy Saving Policies as follows: ▪ Cleaning methods utilised for cleaning vehicles, floors, the offices etc. should aim to minimise water use (e.g. sweep before wash-down). ▪ Where possible, encourage the re-use of water. ▪ Ensure that regular audits of water systems are conducted to identify possible water leakages. ▪ Consider installing water saving	▪ Record water usage during the operational phase, conduct audits and record non-compliance and incidents.	▪ Monthly	▪ Facility Manager

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		devices (e.g. dual flush toilets, automatic shut-off taps, etc.).			
		11.11.2. Carry out environmental awareness training with a discussion on water usage and conservation, and make operational personnel aware of the importance of limiting water wastage.	▪ Conduct training for all operational personnel.	▪ As and when required during operations and ensure that all new staff are inducted.	▪ Facility Manager
11.12. Non respect of waste management practices	Minimise the production of general waste. Ensure compliance with relevant waste management legislation. Minimise pollution of the environment.	11.12.1. Control and implement waste management plans. Ensure that relevant legislative requirements are respected. 11.12.2. Determine specific areas on site for temporary management of waste.	▪ Control of waste management practices throughout operation phase.	▪ Monthly	▪ Facility Manager
		11.12.3. Promote waste reduction, re-use, and recycling opportunities on site during the operation phase. 11.12.4. Ensure an adequate and sustainable use of resources.	▪ Monitor waste generation and collection throughout operation.	▪ Monthly	▪ Facility Manager
11.13. Excessive generation of waste water on site during the operation phase	Maintain reasonable levels of waste water generation	11.13.1. Waste water must be collected and disposed of at a suitable licenced disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	▪ Waste water generation to be monitored throughout the operational phase. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Quarterly	▪ Facility Manager
11.14. Risk of fire, explosion or release of toxic gas.	Reduce fire, explosion or release of toxic gas risk from battery storage	11.14.1. Should electrolyte solutions be stored on site, these should be stored away from incompatible materials such as all peroxides, such as hydrogen peroxide;	▪ Adhere to Materials and Safety Data Sheet (MSDS)s of the electrolytes.	▪ On-going	▪ Operations and Maintenance

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
	facility.	chemicals that react with acid to generate a gaseous product, such as carbonate and bicarbonates, sulfites and bisulfites; strong reducing agents, such as alkaline metals (Li, Na, K) and alkaline earth metals (Be Mg Ca, Sr, Ba); reactive metals such as aluminum and zinc, all hydrides (such as $LiAlH_4$, $NaBH_4$), and some carbides (such as CaC_2).			Contractor
D. DECOMMISSIONING PHASE					
11.15. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.					

12 SPECIFIC PROJECT RELATED ENVIRONMENTAL IMPACTS

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
A. DESIGN PHASE					
A.1. VISUAL IMPACTS					
12.1. Potential visual intrusion of construction activities on existing views of sensitive visual receptors.	Reduce visual intrusion of construction activities project wide.	12.1.1. Ensure plans are in place to minimise fire hazards and dust generation. 12.1.2. Ensure plans are in place to rehabilitate temporary cleared areas as soon as possible.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ During design cycle and before construction commences.	▪ Project Owner ▪ ECO
		12.1.3. Clearance of the area for the solar field should be phased in such a way that the exposed area is always at a minimum.	▪ Ensure that this is taken into consideration prior to the commencement of construction by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase.	▪ Project Owner
	Reduce visual intrusion of the solar energy facility.	12.1.4. A maintenance plan for buildings and structures should be in place. 12.1.5. Colours of buildings and structures should blend in with the landscape background where this is technically feasible and where it will not negatively affect the functionality of the structures. 12.1.6. Materials, coatings and paints should be chosen based on minimal reflectivity, where possible. 12.1.7. Grouped structures should be painted in the same colour where this will not affect the	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ During design cycle and before construction commences.	▪ Project Owner and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		functionality of the structures, to reduce visual complexity and contrast. 12.1.8. Appropriate coloured materials should be used for structures to blend in with the backdrop of the project. 12.1.9. Appropriate colours for smooth surfaces often need to be two to three shades darker than the background colour to compensate for shadows that darken most textured natural surfaces.			
12.2. Potential impact of night lighting of the Solar PV Facility on the nightscape of the region.	Reduce the impact of night lighting of structures and buildings associated with the solar energy facility on the surrounding nightscape and visual receptors.	12.2.1. A lighting plan for the proposed Solar PV plant that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised and that also demonstrates that project lighting is effectively shielded from surrounding and adjacent properties must be prepared with the design plans of the plant. The plan should minimize light spill onto neighbouring properties and glare which can affect visual receptors in the surrounding landscape. 12.2.2. The lighting plan should also minimize contribution to light pollution (night glow) of the regional nightscape. 12.2.3. The lighting plan should include a process for promptly addressing and mitigating complaints about potential lighting impacts. 12.2.4. Lighting of the facility should not exceed, in number of lights and brightness, the minimum	▪ A lighting specialist should be contracted to design the lighting plan for the project. The plan should provide for temporary lighting during the construction and decommissioning phases of all components of the project. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ During design cycle and before construction commences. ▪ Once-off during the design phase.	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		required for safety and security. 12.2.5. Uplighting and glare (bright light) should be minimised using appropriate screening. 12.2.6. Low-pressure sodium light sources should be used to reduce light pollution. 12.2.7. Light fixtures should not spill light beyond the project boundary. 12.2.8. Install timer switches or motion detectors (within safety requirements) to be used to control lighting in areas that are not occupied continuously.			
A.2. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)					
12.3. Impacts to archaeology and graves.	Achieve a layout that minimizes the potential later impacts to archaeological resources and/or graves.	12.3.1. Ensure that project layout avoids as many known archaeological resources and/or graves as possible.	▪ Take cognizance of the archaeological sites reported in the HIA when designing facility layout. ▪ Appoint a professional archaeologist to carry out a pre-construction walk down survey.	▪ Once-off (at least 6 months in advance of construction)	▪ Project Owner
12.4. Impacts to the natural and cultural landscape.	Reduce the degree of visual contrast in the landscape.	12.4.1. Plan to use an earth-coloured paint on the built elements of the facility.	▪ Include earth-coloured paint in the design specifications for the facility.	▪ Once-off	▪ Project Owner
A.3. SOCIAL IMPACTS					

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
12.5. In-migration of potential job seekers into the Kenhardt area.	Proactively manage the in-migration of potential employment seekers and in so doing mitigate impacts on existing social structures.	12.5.1. Develop and implement a Workforce Recruitment Plan. 12.5.2. Reserve employment, where practical, for local residents. 12.5.3. Clearly define and agree upon the Project Affected People (PAP). 12.5.4. Develop a database of PAP and their relevant skills and experience. 12.5.5. Develop and implement a Stakeholder Engagement Plan.	▪ Mitigation measures (12.5.1); (12.5.4) and (12.5.5) requires the drafting of a document which would in each instance serve as the method through which the mitigation actions are monitored. ▪ Mitigation measures (12.5.2) and (12.5.3) requires clear statements regarding for whom work would be reserved (i.e. mitigation measure (12.5.2)) and who the PAP is (i.e. mitigation measure (12.5.3)).	▪ Once-off during the design phase.	▪ Project Owner
12.6. Economic Development Plan.	Draft an Economic Development Plan to align local investment with bona fide local needs.	12.6.1. The Economic Development Plan should adhere to all requirements of the relevant RFP at that time of implementation.	▪ The drafting of the EDP would serve as the method through which the mitigation action is monitored.	▪ Once-off during the design phase.	▪ Project Owner
A.4. ELECTROMAGNETIC AND RADIO FREQUENCY INTERFERENCE					
12.7. Impact on the nearest and surrounding Square Kilometer Array (SKA) telescopes and the overall SKA project.	To reduce the impact of the proposed PV project on the SKA. The mitigation required should include an allowance of 8dB for cumulative impact of adjacent sites totaling less than 40dB.	12.7.1. 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 it must be ensured that: ▪ Radio Frequency Interference (RFI) gasketting is placed on all the seams and doors. ▪ RFI Honeycomb filtering should be placed on all ventilation openings.	▪ Ensure that the requirements and mitigation practices are incorporated into the design of the proposed PV plant during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase.	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		12.7.2. It is important to ensure that the cables are laid directly in the soil or properly grounded cable trays (not plastic sleeves). 12.7.3. The use of bare copper directly in the soil for earthing is recommended to shunt Common Mode (CM) interference currents to ground. 12.7.4. In the case of a tracking PV plant design, care will need to be taken to shield the noise associated with the relays, contactors and hydraulic pumps/motors of the tracking units. 12.7.5. Data communications to and from the plants should be via fibre optic.			
A.5. IMPACT ON SURFACE WATER RESOURCES					
12.8. Impact on surface water resources.	To reduce the impact of the proposed PV project on the surrounding drainage lines.	12.8.1. Ensure that the Department of Water and Sanitation are consulted with to confirm the need and requirements of a Water Use Licence, as noted in the Ecological Impact Assessment.	▪ Ensure that the requirements of the Department of Water and Sanitation are considered during the planning and design phase. ▪ Ensure that the Water Use Licence is submitted and approved prior to the commencement of construction, based on the requirements of the Department of Water and Sanitation. ▪	▪ Once-off during the design phase.	▪ Project Owner
B. CONSTRUCTION PHASE					
B.1. ECOLOGICAL IMPACTS (TERRESTRIAL, AQUATIC)					

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
12.9. Changes in edaphics (soils) on account of excavation and import of soils, resulting in changes in soil state, compaction, and alteration of plant communities and fossorial species in and around these points etc.	Avoidance of undue disturbance to soils.	12.9.1. Ripping of compact soils to be considered according to site specifics and impact.	▪ If deemed applicable, monitor the manual or machine driven ripping of compact soils.	▪ Intermittent and upon identification of excess compaction or option of ripping is considered necessary (i.e. when and where extensive compaction arises).	▪ Contractor and Project Owner
12.10. Abstraction from sub surface aquifers may have a significant impact on plant water relations.	To reduce excessive abstraction of sub surface waters and impacts on groundwater.	12.10.1. Identify yield and water quality levels in borehole prior to establishment (that is if borehole water will be used). 12.10.2. Identify limitations on rate and level of abstraction. 12.10.3. Identify alternative water sources (such as municipal supply).	▪ Ensure borehole is registered with imposed limits on abstraction. ▪ Undertake blow test on boreholes (if required). ▪ Undertake water quality analysis. ▪ Install flow meter during construction period and beyond (if borehole water will be used). ▪ Ensure that Municipal or alternate Supply is arranged prior to the commencement of the construction phase.	▪ Prior to construction	▪ Project Owner
12.11. Alteration of surface water	To manage construction activities that may impact	12.11.1. Avoidance of significant earthworks with	▪ Undertake site and visual inspections and reporting any	▪ Ongoing	▪ Contractors, Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
quality leading to changes in water chemistry.	on surface and subsurface water quality.	concomitant risk of increasing silt mobility. 12.11.2. Conduct judicious excavation and clearance. 12.11.3. Undertake stabilisation of disturbed soils. 12.11.4. Implement the use of surface flow attenuators or energy dissipaters (if required). 12.11.5. Management of potential liquid material that may be classified as hazardous. 12.11.6. Management of hazardous waste. 12.11.7. Avoid significant sculpting of land and maintenance of the general topography of site.	non-compliance. ▪ Containment of hazardous waste and hazardous materials.		and ECO
12.12. Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure.	Limit alteration of surface drainage, leading to changes in plant communities and general habitat structure, patters due to construction activities.	12.12.1. Avoidance of major drainage features during construction. The proposed project footprint must be demarcated to reduce unnecessary disturbance beyond the proposed project area. Demarcate as no-go areas. 12.12.2. Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible). 12.12.3. Avoidance of significant sculpting of land and maintenance of the general topography of the site. 12.12.4. Maintenance of a high level of housekeeping on site during the construction phase. 12.12.5. Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertake removal of solid waste	▪ Carry out visual inspections to ensure strict control over the behaviour of staff in order to restrict activities to within demarcated areas. ▪ Monitor the construction period to verify if this is being undertaken (where possible). ▪ Carry out visual inspections to ensure minimal impact on soils and erosion. ▪ Monitor the condition of the site camp throughout the construction phase via visual site inspections. Record non-compliance and incidents.	▪ Ongoing ▪ Ongoing ▪ Ongoing ▪ Ongoing ▪ Ongoing	▪ ECO ▪ Contractor, Project Owner and ECO ▪ Contractor, Project Owner and ECO ▪ ECO ▪ Contractor, Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		and litter on a regular basis.	▪ Monitor the condition of drainage features immediately outside of the footprint of the PV plant and the condition of the construction area throughout the construction phase via visual site inspections. Record non-compliance and incidents.		
B.2. VISUAL IMPACTS					
12.13. Potential visual intrusion of construction activities on existing views of sensitive visual receptors.	Prevent unnecessary visual clutter and focusing attention of surrounding visual receptors on the proposed development.	12.13.1. Preparation of the solar field area (i.e. clearance of vegetation, grading, contouring and compacting) and solar field construction should be phased in a way that makes practical sense in order to minimise the area of soil exposed and the shortest duration of exposure.	▪ Ensure that this is taken into consideration prior to the commencement of construction. ▪ Conduct site inspections to monitor the phasing of construction to verify unnecessary soil disturbance and clearing and report any non-compliance.	▪ Once-off during the construction phase. ▪ Weekly	▪ Project Owner and Contractor ▪ ECO
		12.13.2. Parking areas should be demarcated and strictly controlled so that vehicles are limited to specific areas only.	▪ Carry out visual inspections to ensure the construction area and parking area is demarcated clearly, and record and report any non-compliance. ▪ Carry out visual inspections to ensure strict control over the parking of construction vehicles and access routes in order to restrict activities to within demarcated areas.	▪ Weekly ▪ Weekly	▪ ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		12.13.3. Night time construction should be avoided where possible.	▪ Construction operation times to be monitored and managed (as well as included in the tender contract).	▪ Weekly	▪ ECO
		12.13.4. Night lighting of the construction sites should be minimised within requirements of safety and efficiency.	▪ Complaints about night lights should be investigated and documented in a register.	▪ As complaints arise	▪ Contractor and ECO
	Reduce the visual impact of construction activities project wide	12.13.5. Maintain good housekeeping on site to avoid litter and minimize waste. 12.13.6. Monitor construction sites for strict adherence to demarcated boundaries. 12.13.7. Monitor adherence to lighting plan. 12.13.8. Monitor adherence to rehabilitation plan. 12.13.9. Monitor adherence to erosion control plan. 12.13.10. Monitor adherence to dust and fire control plans.	▪ Carry out site visits and inspections of the construction sites and ensure good housekeeping is maintained. Record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance. ▪ Complaints about night lights should be investigated and documented in a register. Investigate any complaints about night lights and document it in a register. ▪ Visit sites requiring rehabilitation. ▪ Carry out site visits and record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance.	▪ Daily ▪ Daily ▪ Daily and as complaints arise. ▪ Daily ▪ Daily ▪ Daily	▪ Construction Manager and ECO

<table>
<tr><th rowspan="2">Impact</th><th rowspan="2">Mitigation/Management Objectives</th><th rowspan="2">Mitigation/Management Actions</th><th colspan="3">Monitoring</th></tr>
<tr><th>Methodology</th><th>Frequency</th><th>Responsibility</th></tr>
<tr><td colspan="6">B.3. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)</td></tr>
<tr><td rowspan="2">12.14. Construction vehicles and activities could result in damage to or destruction of archaeological sites and/or graves.</td><td rowspan="2">Minimise the chances of significant archaeological sites and/or graves being disturbed.</td><td>12.14.1. Ensure that all heritage resources requiring mitigation are mitigated (such as cordoning off and protecting the EAS-MSA-LSA pan) prior to the start of construction.
12.14.2. Ensure that no activity takes place outside of the authorized construction footprint.</td><td>▪ Carry out visual inspections to ensure strict control over the behaviour of construction staff in order to restrict activities to within demarcated areas.</td><td>▪ Weekly</td><td>▪ ECO</td></tr>
<tr><td>12.14.3. The Contractor and ECO must be informed of the possibility of any heritage material (i.e. ensure that all personnel are aware of the potential of encountering graves and what to do if this occurs (i.e. to report any suspicious stone features prior to disturbance)).
12.14.4. Alternatively commission an archaeologist to examine the final development footprint at least six months prior to the commencement of construction.</td><td>▪ Carry out Environmental Awareness Training to ensure that the Contractors are informed of the possible type of heritage features that may be encountered during the construction phase.
▪ Conduct audits of the signed attendance registers.
▪ Appoint a professional archaeologist to examine the construction footprint.
▪ Conduct an audit to verify that the necessary permits are obtained by the archaeologist, if required.</td><td>▪ Once-off training and ensure that all new staff are inducted.
▪ Monthly
▪ Once-off six months prior to construction.
▪ As required/ necessary during the construction phase.</td><td>▪ Contractor/ ECO
▪ ECO</td></tr>
</table>

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		12.14.5. If archaeological sites and potential graves cannot be avoided, the buffers as stipulated in the HIA should be implemented during the construction phase.	▪ Carry out visual inspections to ensure strict control over the behaviour of construction staff in order to restrict activities to within demarcated areas and outside of the buffer area.	▪ Weekly	▪ ECO
		12.14.6. If any of the graves or potential graves found on site cannot be avoided then an archaeologist should be contracted to conduct a test excavation to determine the status of the feature. If it is determined to be a grave, then exhumation would need to occur (if necessary) with the permission of SAHRA (and in accordance with any requirements that SAHRA might impose at the time).	▪ Appoint a professional archaeologist to conduct a test excavation to determine if the sites are graves. ▪ Conduct an audit to verify that the necessary permits are obtained by the archaeologist for the test excavation, if required.	▪ As potential graves are encountered	▪ Project Owner
		12.14.7. If any concentrations of archaeological material, graves or stone features are uncovered during the proposed construction, 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. Sufficient time should be allowed to remove/collect such material.	▪ Monitor excavations and construction activities for archaeological materials via visual inspections and report the finds accordingly. ▪ Contact the heritage authorities and the identified archaeologist if any heritage features are uncovered.	▪ Daily or during excavations. ▪ As required/ necessary during the construction phase.	▪ Contractor and ECO ▪ Project Owner
12.15. Alteration of the landscape	Reduce visual contrast of the development in the	12.15.1. Minimise surface footprint and the amount of white structures visible.	▪ Monitor the paint colour via visual inspections and report non-	▪ Once-off, at an appropriate time	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
from rural to industrial in nature.	landscape.		compliance.	during construction period.	
B.4. PALAEONTOLOGICAL HERITAGE IMPACTS					
12.16. Loss of legally-protected palaeontological heritage resources at or beneath ground surface within development footprint (fossils, fossil sites and contextual geological data).	Reporting, conservation, recording and judicious sampling of scientifically important fossil material exposed during the construction phase of development (The paleontological sensitivity of the site is reported as Very Low in the Palaeontological Study) .	12.16.1. Reporting chance fossil finds to SAHRA for possible professional mitigation.	▪ Monitoring of all substantial excavations into sedimentary bedrocks for fossil material (e.g. vertebrate bones & teeth, fossilized wood, shells) ▪ Safeguarding of chance fossil finds, preferably in situ.	▪ Throughout the construction phase ▪ Throughout the construction phase	▪ ECO ▪ ECO
		12.16.2. Recording and sampling of fossil material and associated geological data (only necessary for chance fossil finds made during the proposed development).	▪ Application by a qualified palaeontologist for fossil collection permit from SAHRA. ▪ Palaeontologist to undertake field study of fossil finds in situ on site. Photography and sampling of important finds. ▪ Curation of fossils collected in an approved repository (museum/ university collection).	▪ Following alert of chance fossil finds on site (It is important to note that there is no need for on-site palaeontological monitoring unless new fossil finds are made during development).	▪ Qualified palaeontologist appointed and commissioned by the Project Owner. ▪ Qualified palaeontologist appointed and commissioned by the Project Owner ▪ Qualified palaeontologist appointed and commissioned by the Project

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
					Owner
B.5. SOILS AND AGRICULTURAL POTENTIAL IMPACTS					
12.17. Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to constructional disturbance and potential trampling by vehicles.	To conserve the surrounding natural veld vegetation.	12.17.1. Minimize footprint of disturbance during the construction phase and ensure that construction work is undertaken within the demarcated area only. 12.17.2. Confine vehicle access on roads only. 12.17.3. Control dust generation during construction activities by implementing standard construction site dust control measures (dampening with water) where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.	▪ Monitor the construction activities via site audits to ensure that they are undertaken within the demarcated construction area, and record non-compliance and incidents. ▪ Include periodic site inspection in environmental performance reporting that specifically records occurrence or not of off-road vehicle tracks surrounding the site. Monitor via site audits and record non-compliance and incidents. ▪ Monitor dust suppression mechanisms via visual inspections and record non-compliances. Maintain an incidents/ complaints register. The date, time, nature of complaint, name of complainant and corrective actions must be logged for all complaints. Complaints must be investigated and, if appropriate, acted upon.	▪ Daily ▪ Monthly during the construction phase ▪ Monthly and during complaints/incidents	▪ Contractor and ECO ▪ ECO ▪ Contractor and ECO
12.18. Loss of topsoil due to poor topsoil	Ensure effective topsoil covering to conserve soil fertility on all disturbed	12.18.1. Strip and stockpile topsoil from all areas where soil (below surface) will be disturbed. 12.18.2. After cessation of disturbance, re-spread	▪ Establish an effective record keeping system for each area where soil is disturbed for	▪ As needed, dependent on the specifics of	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
management.	areas, after they have been rehabilitated.	topsoil over the surface. 12.18.3. Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	construction purposes. These records should be included in environmental performance reports, and should include all the records below: o Record the GPS coordinates of each area. o Record the date of topsoil stripping. o Record the GPS coordinates of where the topsoil is stockpiled. o Record the date of cessation of construction activities at the particular site. o Photograph the area on cessation of construction activities. o Record date and depth of re-spreading of topsoil. o Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.	construction activities.	

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
12.19. Soil erosion due to alteration of the land surface characteristics.	To reduce erosion on site and downstream of the site as a result of run-off from the site, or due to wind erosion.	12.19.1. Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	▪ Include periodic site inspection in environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	▪ Monthly during the construction phase.	▪ ECO
B.6. SOCIAL IMPACTS					
12.20. Influx of job seekers into the Kenhardt area.	Control influx of job seekers into the Kenhardt area with the aim of protecting local social structures.	12.20.1. Implement the Workforce Recruitment Plan. 12.20.2. Ensure employment is reserved, where practical, for local residents. 12.20.3. Actively use the database of PAP and their relevant skills and experience to guide local employment. 12.20.4. Implement the Stakeholder Engagement Plan.	▪ Verify that local labour is, as far as practically possible, being used, by cross-referencing the Workforce Recruitment Plan with current recruitment practices, as well as cross-referencing employed personnel with PAP database; ▪ Verify that Stakeholder Engagement Plan is being implemented with written proof of such engagement with the PAP.	▪ Three times during the estimated 14 month construction period (i.e. at 3 months, 6 months, and 9 months).	▪ Construction Manager and ECO
12.21. Outsiders move into the Kenhardt area.	Limit incidences of social deviance in the Kenhardt area.	12.21.1. Implement the Workforce Recruitment Plan. 12.21.2. Ensure employment is reserved, where practical, for local residents.	▪ Verify that local labour is, as far as practically possible, being used, by cross-referencing the Workforce Recruitment Plan with	▪ Three times during the estimated 14 month construction period (i.e. at 3	▪ Construction Manager and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		12.21.3. Actively use the database of PAP and their relevant skills and experience to guide local employment. 12.21.4. Implement the Stakeholder Engagement Plan	current recruitment practices, as well as cross-referencing employed personnel with PAP database; ▪ Verify that Stakeholder Engagement Plan is being implemented with written proof of such engagement with the PAP.	months, 6 months, and 9 months).	
12.22. Expectations created regarding possible employment.	Prevent frustration resulting from miscommunication of employment opportunities and project-related benefits in the local community.	12.22.1. Implement the Stakeholder Engagement Plan	▪ Verify that Stakeholder Engagement Plan is being implemented with written proof of such engagement with the PAP.	▪ Three times during the estimated 14 month construction period (i.e. at 3 months, 6 months, and 9 months).	▪ Construction Manager and ECO
12.23. Local spending.	Ensure the generation of socio-economic benefits as a result of the multiplier effect.	12.23.1. Procure goods and services, where practical, within the study area 12.23.2. Obtain regularly required goods and services from as large a selection of local service providers as possible	▪ Verify purchase of local goods and services through proof of purchase.	▪ Three times during the estimated 14 month construction period (i.e. at 3 months, 6 months, and 9 months).	▪ Construction Manager and ECO
12.24. Local employment.	Ensure optimum employment creation while taking cognizance of the local levels of experience and education.	12.24.1. Implement the Workforce Recruitment Plan	▪ Verify that local labour is, as far as practically possible, being used, by cross-referencing the Workforce Recruitment Plan with current recruitment practices, as well as cross-referencing employed personnel with PAP database.	▪ Three times during the estimated 14 month construction period (i.e. at 3 months, 6 months, and 9 months).	▪ Construction Manager and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
12.25. Economic Development Plan.	Ensure contribution to local employment, local spending and human capacity development is being made.	12.25.1. Implement the Economic Development Plan	▪ Verify that the Economic development Plan is being implemented.	▪ Three times during the estimated 14 month construction period (i.e. at 3 months, 6 months, and 9 months).	▪ Construction Manager and ECO
B.7. GEOHYDROLOGY IMPACTS					
12.26. Potential impact on groundwater as a result of the construction of storage yards and temporary labour accommodation camps (i.e. wastewater from construction activities disposed of on the site leading to environmental impacts (e.g. groundwater pollution)).	To prevent unnecessary infiltration of polluted surface water	12.26.1. Waste water from labour accommodation site camps or yards must be collected in a designated container and disposed of at a suitable disposal point off site (i.e. a licenced waste disposal facility). A suitable waste contractor must be appointed to collect waste from site on a regular basis for correct disposal. Proof of disposal (waybills or waste disposal slips) must be retained and kept on file for auditing purposes. 12.26.2. Other non-hazardous solid waste (e.g. refuse) to be disposed of at a licensed landfill. A suitable waste contractor must be appointed to collect waste from site on a regular basis for correct disposal. Proof of disposal (waybills or waste disposal slips) must be retained and kept on file for auditing purposes. 12.26.3. Avoid using old or damaged construction equipment and vehicles and ensure that they are well maintained and regularly serviced in order to ensure no leakages.	▪ Monitor the placement of structures, storage yards, accommodation camps and infrastructure during the construction phase to ensure existing wind pumps / boreholes are not damaged. ▪ Waste removal and disposal to be monitored. Monitor via site audits and record non-compliance and incidents. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. ▪ Construction vehicles need to be monitored throughout the construction phase. Monitor via site audits and record non-compliance and incidents. ▪ Monitor the placement and designation of the area for	▪ Once off prior to the commencement of construction. ▪ Weekly ▪ Four times per annum for the construction period, i.e. at 3 months, 6 months, 9 months and 12 months. ▪ Weekly	▪ Project Owner ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		12.26.4. Any engines that stand in one place must have drip trays, fuel storage tanks should be above ground on an impermeable surface (within a bunded area) and construction vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for refuelling activities and drip trays or similar impervious materials must be used during these procedures. Vehicle and washing areas must also be on paved surfaces and the by-products correctly managed.	refuelling at the site camp via visual inspections. Monitor the usage of spill containment measures and record and report non-compliance.		
12.27. Potential impact on groundwater as a result of stormwater outflows.	To prevent unnecessary infiltration of polluted storm water	12.27.1. Ensure the storm water runoff is not contaminated. All reasonable measures must be taken to prevent the contamination of storm water outflows.	▪ Monitor the quality of the storm water ▪ ECO to verify that measures are in place to reduce the contamination of storm water and to monitor the quality of storm water by undertaking site visits and visual inspections.	▪ If possible do this during or shortly after a storm event, at the start of the rain season. ▪ Weekly	▪ Project Owner and ECO. ▪ ECO
12.28. Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.	To reduce the potential of groundwater pollution.	12.28.1. Avoid using old or damaged construction equipment and vehicles and ensure that they are well maintained and regularly serviced in order to ensure no leakages. 12.28.2. Any engines that stand in one place for an excessive length of time, must have drip trays, fuel storage tanks should be above ground on an impermeable surface (within a bunded area) and construction vehicles and equipment should also be refuelled on an	▪ Construction vehicles need to be monitored throughout the construction phase. Monitor via site audits and record non-compliance and incidents. ▪ Monitor the placement and designation of the area for refuelling at the site camp via visual inspections. Monitor the usage of spill containment	▪ Four times per annum for the construction period, i.e. at 3 months, 6 months, 9 months and 12 months. ▪ Weekly ▪ Weekly	▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		impermeable surface. A designated area should be established at the construction site camp for refuelling activities and drip trays or similar impervious materials must be used during these procedures. If liquid product is being transported it must be ensured this does not spill during transit. 12.28.3. If spillages occur during refuelling, they should be contained and removed as rapidly as possible, with correct disposal of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes. During the operational phase, the same principles should be adhered to. Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.	measures and record and report non-compliance. ▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages.		
B.8. WASTE MANAGEMENT					
12.29. Pollution of the surrounding environment (including drainage lines) as a result of the handling, temporary stockpiling and disposal of general waste.	Reduce environmental impacts such as soil, surface water and groundwater contamination as a result of incorrect storage, handling and disposal of general waste. Minimise the production of waste.	12.29.1. General waste (i.e. construction waste, building rubble, discarded concrete, bricks, tiles, wood, glass, window panes, air conditioners, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) generated during the construction phase should be stockpiled temporarily (i.e. once-off) on site in a designated area within suitable waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate.	▪ Monitor the strategic placement of the temporary, designated waste stockpiling area at the site camp via visual inspections, and record and report any non-compliance. ▪ Monitor the temporary storage and handling of general waste on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage	▪ Once-off prior to the commencement of the construction phase and as required as the construction phase process evolves. ▪ Daily	▪ ECO and Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
	Prevent environmental problems (e.g. pollution / change in soil pH) due to solid and liquid wastes disposed of on the site. Ensure compliance with waste management legislation.		area).		
		12.29.2. Should the on-site stockpiling of general waste exceed 100 m^3 and a period of 90 days, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to.	▪ Record the amount of general waste that is temporarily stockpiled at the designated area on site, as well as the duration and record non-compliance and incidents. ▪ Monitor the duration and amounts of general waste that is temporarily stockpiled at the designated area on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage area). ▪ Audit compliance with the Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) if the storage amounts are exceeded (i.e. only if required).	▪ Daily ▪ Weekly ▪ Monthly	▪ Contractor ▪ ECO ▪ Project Owner
		12.29.3. Ensure that the designated stockpiling area for general waste (i.e. skips and waste collection bins) is inspected on a daily basis to verify its condition and integrity, particularly after rainfall events.	▪ Monitor the temporary, designated waste stockpiling area at the site camp, as well as the handling of general waste on site via site audits and record non-compliance and incidents.	▪ Daily	▪ ECO
		12.29.4. Ensure that general waste generated during the construction phase is removed from the	▪ Ensure that a suitable Waste Management Contractor is	▪ Once-off prior to the construction	▪ Project Owner / Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		site on a regular basis, and safely disposed of at an appropriate, licensed waste disposal facility by an approved waste management Contractor. Waste disposal slips or waybills should be kept on file as proof of disposal. As a general principle, waste manifests must be obtained to prove legal disposal of waste.	appointed to remove and dispose the general waste at an appropriate, licensed waste disposal facility. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	phase. ▪ Weekly	▪ ECO
		12.29.5. Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal methods. Littering must be prevented through effective site camp management.	▪ Monitor the condition of the site camp throughout the construction phase via visual site inspections. Record non-compliance and incidents. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Daily ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO and Contractor ▪ ECO
		12.29.6. Sufficient general waste disposal bins must also be provided for use by construction personnel throughout the site. These bins must be emptied on a regular basis.	▪ Monitor general waste generation by construction staff and collection via audits throughout the construction phase.	▪ Daily or Weekly	▪ ECO and Contractor.
		12.29.7. Ensure that all general waste emanating from the construction phase is removed from site prior to the commencement of the rehabilitation and operational phases.	▪ Undertake a final inspection at the end of the construction phase in order to verify and ensure that all general waste is removed from site and correctly disposed, prior to the commencement of the rehabilitation and operational	▪ At the end of the construction phase.	▪ ECO and Contractor.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			phases.		
		12.29.8. Promote waste reduction, re-use, and recycling opportunities on site during the construction phase.	▪ Monitor waste generation and collection throughout construction. ▪ Investigate if any, complaints have been expressed by the surrounding community regarding waste handling.	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.29.9. Ensure an adequate and sustainable use of resources.	▪ Monitor waste generation and collection throughout construction.	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.29.10. Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected.	▪ Control of waste management practices throughout construction phase	▪ Weekly or bi-weekly	▪ ECO and Contractor
12.30. Pollution of the surrounding environment as a result of the handling, temporary stockpiling and disposal of hazardous waste.	Reduce environmental impacts such as soil, surface water and groundwater contamination as a result of incorrect storage, handling and disposal of hazardous waste.	12.30.1. Hazardous waste (i.e. empty tins, oils, fuel spillages, spilled materials and chemicals etc.) generated during the construction phase should be stockpiled temporarily (i.e. once-off) on site in a designated area in suitable waste collection bins and leak-proof storage skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate. Hazardous waste must be stored separately from all other general waste. The designated stockpiling area must be labelled correctly.	▪ Monitor the strategic placement of the temporary, designated waste stockpiling area at the site camp via visual inspections, and record and report any non-compliance. ▪ Monitor the temporary storage and handling of hazardous waste on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage area).	▪ Once-off prior to the commencement of the construction phase and as required as the construction process evolves. ▪ Daily	▪ ECO and Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		12.30.2. Should the on-site stockpiling of hazardous waste exceed 80 m^3, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to.	▪ Record the amount of hazardous waste that is temporarily stockpiled at the designated area on site, as well as the duration and record non-compliance and incidents. ▪ Monitor the duration and amounts of hazardous waste that is temporarily stockpiled at the designated area on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage area). ▪ Audit compliance with the Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) if the storage amounts are exceeded (i.e. only if required).	▪ Daily ▪ Weekly ▪ Monthly	▪ Contractor ▪ ECO ▪ Project Owner
		12.30.3. Ensure that the designated stockpiling area for hazardous waste (i.e. leak proof skips and waste collection bins) is inspected on a daily basis to verify its condition and integrity, particularly after rainfall events.	▪ Monitor the temporary, designated waste stockpiling area at the site camp, as well as the handling of hazardous waste on site via site audits and record non-compliance and incidents.	▪ Daily	▪ ECO
		12.30.4. Ensure that all hazardous waste is removed from the site on a regular basis, and safely disposed at an appropriate, licensed	▪ Ensure that a suitable Waste Management Contractor is appointed to remove and dispose	▪ Once-off prior to the construction phase.	▪ Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		hazardous waste disposal facility by an approved waste management Contractor.	the hazardous waste at an appropriate, licensed hazardous waste disposal facility. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Weekly	
		12.30.5. Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal methods. Littering must be prevented through effective site camp management.	▪ Monitor the condition of the site camp throughout the construction phase via visual site inspections. Record non-compliance and incidents. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Daily ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO and Contractor ▪ ECO
		12.30.6. Ensure that all hazardous waste emanating from the construction phase is removed from site prior to the commencement of the rehabilitation and operational phases.	▪ Undertake a final inspection at the end of the construction phase in order to verify and ensure that all general waste is removed from site and correctly disposed, prior to the commencement of the rehabilitation and operational phases.	▪ At the end of the construction phase.	▪ ECO and Contractor.
		12.30.7. All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means.	▪ Waste removal and disposal to be monitored throughout construction	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.30.8. Adequate containers for the cleaning of equipment and materials (paint, solvent) must	▪ Waste removal and disposal to be monitored throughout	▪ Weekly or bi-weekly	▪ ECO and

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		be provided as to avoid spillages.	construction		Contractor
		12.30.9. Waste water from construction and painting activities must be collected in a designated container and disposed of at a suitable disposal point off site.	▪ Waste removal and disposal to be monitored throughout construction	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.30.10. Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected.	▪ Control of waste management practices throughout construction phase.	▪ Weekly or bi-weekly	▪ ECO and Contractor
C. OPERATIONAL PHASE					
C.1. ECOLOGICAL IMPACTS (TERRESTRIAL, AQUATIC AND AVIFAUNA)					
12.31. Erosion control measures. The impact of wind and water erosion results in loss of surface soils and degradation of land.	To mitigate and manage the site to prevent any soil loss arising from wind and water.	12.31.1. Where appropriate and within the general drainage of the site, attenuators (or similar) should serve to reduce flow energy, while the maintenance of general vegetation cover to avoid excessive aeolian impacts should be implemented.	▪ Monitor the erosion on site during operations, as well as the implementation and effectiveness of erosion control on site (such as the use of gabions and geofabric materials or similar) at appropriate points.	▪ Ongoing and as required	▪ Project Owner and Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
12.32. Alteration of the state of subsurface water resources due to excessive abstraction of groundwater for the cleaning of the PV panels, as well as for operational use.	To reduce excessive abstraction of sub surface waters and impacts on groundwater.	12.32.1. Identify alternative water sources, such as municipal supply. 12.32.2. Preferential use of recycled water sources for operational phase requirements (instead of groundwater). 12.32.3. Ensure the prudent use of surface water resources. 12.32.4. Adopt "dry" cleaning methods, such as dusting and sweeping the site before washing down. 12.32.5. Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. 12.32.6. Low level and ongoing cleaning of PV panels over time to reduce demand on aquifers.	▪ Ensure that Municipal Supply or alternate supply is arranged prior to the commencement of the operational phase. ▪ Monitor via site audits and record non-compliance and incidents.	▪ During the operational phase.	▪ Project Owner and ECO
C.2. VISUAL IMPACTS					
12.33. Potential visual intrusion of the proposed Solar Energy Facility on the views of sensitive visual receptors.	Reduce visual intrusion of the solar energy facility on the views of sensitive visual receptors as well as its impact on the surrounding landscape	12.33.1. Monitor effectiveness of the rehabilitation plan for temporarily cleared areas and erosion scarring. 12.33.2. Monitor building and façade maintenance. Painted features should be maintained and repainted when colour fades or paint flakes.	▪ Carry out visual inspections during site audits to verify the effectiveness of the rehabilitation, and record and report any non-compliance. ▪ Carry out an inspection of solar energy facility to ensure that it is being maintained in a good condition.	▪ Monthly ▪ Annually	▪ Project Owner and Environmental Manager/ECO ▪ Project Owner and Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		12.33.3. Maintain re-vegetated surfaces until a self-sustaining stand of vegetation is established and visually adapted to the undisturbed surrounding vegetation. No new disturbance should be created during operations without approval from the Environmental Manager. 12.33.4. Restoration of disturbed land should commence as soon after disturbance as possible. 12.33.5. Road maintenance activities should avoid damaging or disturbing vegetation. 12.33.6. Dust and noxious weed control should be part of maintenance activities.	▪ Carry out visual inspections during site audits to verify the effectiveness of the rehabilitation and the progress of rehabilitation, and record and report any non-compliance. ▪ Ensure that all vegetation removal outside of the project footprint is approved by the Environmental Manager. ▪ Monitor the road maintenance process to ensure limited damage to vegetation. Record and report any non-compliance. ▪ Monitor the presence of alien vegetation on site. ▪ Monitor dust suppression mechanisms and record non-compliances. Maintain an incidents/ complaints register, in which any complaints from the public must be logged. The date, time, nature of complaint, name of complainant and corrective actions must be logged for all complaints. Complaints must be investigated and, if appropriate, acted upon.	▪ Weekly during the rehabilitation phase ▪ Throughout the operational phase ▪ During road maintenance activities. ▪ Throughout the operational phase ▪ During complaints/ incidents	▪ Environmental Manager/ECO ▪ Environmental Manager/ECO ▪ Environmental Manager/ECO ▪ Environmental Manager/ECO ▪ Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
12.34. Potential impact of night lighting of the proposed Solar Energy Facility on the nightscape of the region.	Reduce the impact of night lighting of the proposed PV facility on the surrounding nightscape and sensitive visual receptors.	12.34.1. Monitor the effectiveness of the lighting plan to minimize light spill and glare.	▪ Visit surrounding neighbouring farmsteads and ensure that residents in the surrounding landscape are not affected by glaring lights from the plant. ▪ Complaints about night lights should be investigated and documented in a register. Investigate any complaints about night lights and document it in a register.	▪ Once off at the end of the construction phase or the start of the operational Phase. ▪ As complaints arise.	▪ Project Owner and Environmental Manager/ECO ▪ Project Owner and Environmental Manager/ECO
		12.34.2. Lights should be switched off when not in use whenever it is in line with safety and security.	▪ Carry out visual inspections during site audits to monitor lighting, and record and report any non-compliance.	▪ Weekly	▪ Project Owner and Environmental Manager
C.3. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)					
12.35. Maintenance vehicles and activities could result in damage to or destruction of archaeological sites and/or graves.	Minimise the chances of significant archaeological sites and/or graves being disturbed.	12.35.1. Ensure that no activity takes place outside of the authorized operational footprint.	▪ Carry out visual inspections to ensure strict control over the behaviour of operational staff in order to restrict activities to within demarcated areas.	▪ Weekly	▪ Environmental Manager
C.4. SOILS AND AGRICULTURAL POTENTIAL IMPACTS					
12.36. Soil erosion	To reduce erosion on site	12.36.1. Implement an effective system of run-off	▪ Include periodic site inspection in	▪ Quarterly during the	▪ Environmental

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
due to alteration of the land surface characteristics	and downstream of the site as a result of run-off from the site, or due to wind erosion.	control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	Operational Phase.	Manager/ECO
C.5. SOCIAL IMPACTS					
12.37. Influx of job seekers into the Kenhardt area.	Control influx of job seekers into the Kenhardt area with the aim of protecting local social structures.	12.37.1. Implement the Workforce Recruitment Plan. 12.37.2. Ensure employment is reserved, where practical, for local residents. 12.37.3. Actively use the database of PAP and their relevant skills and experience to guide local employment. 12.37.4. Implement the Stakeholder Engagement Plan.	▪ Verify that local labour is, as far as practically possible, being used, by cross-referencing the Workforce Recruitment Plan with current recruitment practices, as well as cross-referencing employed personnel with PAP database. ▪ Verify that Stakeholder Engagement Plan is being implemented with written proof of such engagement with the PAP.	▪ Once a year during the operational phase.	▪ Environmental Manager/ECO
12.38. Outsiders moves into the Kenhardt area.	Limit incidences of in social deviance in the Kenhardt area.	12.38.1. Implement the Workforce Recruitment Plan. 12.38.2. Ensure employment is reserved, where practical, for local residents. 12.38.3. Actively use the database of PAP and their relevant skills and experience to guide local	▪ Verify that local labour is, as far as practically possible, being used, by cross-referencing the Workforce Recruitment Plan with current recruitment practices, as	▪ Once a year during the operational phase.	▪ Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		employment. 12.38.4. Implement the Stakeholder Engagement Plan.	well as cross-referencing employed personnel with PAP database; ▪ Verify that Stakeholder Engagement Plan is being implemented with written proof of such engagement with the PAP.		
12.39. Expectations created regarding possible employment.	Prevent frustration resulting from miscommunication of employment opportunities and project-related benefits in the local community.	12.39.1. Implement the Stakeholder Engagement Plan.	▪ Verify that Stakeholder Engagement Plan is being implemented with written proof of such engagement with the PAP.	▪ Once a year during the operational phase.	▪ Environmental Manager/ECO
12.40. Local spending.	Ensure the generation of socio-economic benefits as a result of the multiplier effect.	12.40.1. Procure goods and services, where practical, within the study area. 12.40.2. Obtain regularly required goods and services from as large a selection of local service providers as possible.	▪ Verify purchase of local goods and services through proof of purchase.	▪ Once a year during the operational phase.	▪ Environmental Manager/ECO
12.41. Local employment.	Ensure optimum employment creation while taking cognizance of the local levels of experience and education.	12.41.1. Implement the Workforce Recruitment Plan	▪ Verify that local labour is, as far as practically possible, being used, by cross-referencing the Workforce Recruitment Plan with current recruitment practices, as well as cross-referencing employed personnel with PAP database.	▪ Once a year during the operational phase.	▪ Environmental Manager/ECO
12.42. Economic Development	Ensure contribution to local employment, local spending	12.42.1. Implement the Economic Development Plan.	▪ Verify that the Economic development Plan is being	▪ Once a year during the operational	▪ Environmental Manager/

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Plan.	and human capacity development is being made.		implemented.	phase.	Officer
C.6. GEOHYDROLOGY IMPACTS					
12.43. Potential impact on groundwater as a result of stormwater outflows.	To prevent unnecessary infiltration of polluted storm water	12.43.1. Ensure the storm water runoff is not contaminated. All reasonable measures must be taken to prevent the contamination of storm water outflows	▪ Monitor the quality of the storm water. Facility Manager to verify that measures are in place to reduce the contamination of storm water and to monitor the quality of storm water by undertaking site visits and visual inspections.	▪ If possible do this during or shortly after a storm event, at the start of the rain season.	▪ ECO
12.44. Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.	To reduce the potential of groundwater pollution.	12.44.1. Avoid using old or damaged equipment and vehicles and ensure that they are well maintained and regularly serviced in order to ensure no leakages. 12.44.2. Any engines that stand in one place for an excessive length of time, must have drip trays, fuel storage tanks should be above ground on an impermeable surface (within a bunded area) and vehicles and equipment should also be refueled on an impermeable surface. A designated area should be established at the PV facility for refueling activities and drip trays or similar impervious materials must be used during these procedures. If liquid product is being transported it must be ensured this does not spill during transit. 12.44.3. If spillages occur during refueling, they should be contained and removed as rapidly as	▪ Vehicles need to be monitored throughout the operational phase. Monitor via site audits and record non-compliance and incidents. ▪ Monitor the placement and designation of the area for refueling at the site camp via visual inspections. Monitor the usage of spill containment measures and record and report non-compliance. ▪ Monitor the refueling/ servicing process and record the occurrence of any spillages.	▪ Monthly during operations. ▪ Weekly ▪ Weekly	▪ ECO ▪ ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		possible, with correct disposal of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes. During the operational phase, the same principles should be adhered to. Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.			
C.7. WASTE MANAGEMENT					
12.45. Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste (general and hazardous).	Reduce soil and groundwater contamination as a result of incorrect storage, handling and disposal of general and hazardous waste.	12.45.1. Sufficient waste collection bins and skips (or similar) should be provided at the PV facility. Waste collection bins and skips should be covered with suitable material and correctly labelled, and should be kept in a designated, demarcated area, where access control is monitored and managed.	▪ Monitor waste generation and collection throughout the operational phase.	▪ Weekly	▪ Facility Manager
		12.45.2. Segregation of hazardous waste from general waste to be in place. Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types.	▪ On-site inspection of waste segregation. ▪ Control of waste management practices throughout operational phase.	▪ Weekly ▪ Weekly	▪ Facility Manager ▪ Facility Manager
		12.45.3. General waste and hazardous waste should be removed from the site on a regular basis and disposed of at an appropriate, licensed waste disposal facility. Hazardous waste should be removed by an approved waste management Contractor. General solid waste could be removed from the site by municipal services. Waste disposal slips or waybills should be kept	▪ Inspection of the waste storage area. ▪ Monitor via site audits and record non-compliance and incidents. Facility Manager to monitor and audit disposal slips.	▪ Daily ▪ Monthly	▪ Facility Manager

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		on file for auditing purposes as proof of disposal, as applicable			
		12.45.4. Ensure that the PV facility is kept clean at all times and that operational personnel are made aware of correct waste disposal methods.	▪ Conduct training for all operational personnel. ▪ Monitor the state of PV facility via site audits and record non-compliance and incidents.	▪ Once-off during operations and ensure that all new staff are inducted. ▪ Daily	▪ Facility Manager
		12.45.5. No solid waste may be burned or buried on site.	▪ Monitor via site audits and record non-compliance and incidents.	▪ Daily	▪ Facility Manager
		12.45.6. Waste amounts shall be recorded on a monthly basis.	▪ Waste amounts to be documented.	▪ Monthly	▪ Facility Manager
		12.45.7. All operational waste (concrete, steel, rubbles etc.) to be removed from the site and waste hierarchy of prevention, as the preferred option, followed by reuse, recycling, and recovery must be implemented, where possible.	▪ Waste removal and disposal to be monitored	▪ Monthly	▪ Facility Manager
		12.45.8. Other non-hazardous solid waste (e.g. packaging material) to be disposed of at a licensed landfill.	▪ Waste removal and disposal to be monitored	▪ Monthly	▪ Facility Manager
		12.45.9. All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means.	▪ Waste removal and disposal to be monitored	▪ Monthly	▪ Facility Manager
		12.45.10. Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided as to avoid spillages.	▪ Waste removal and disposal to be monitored	▪ Monthly	▪ Facility Manager

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		12.45.11. Waste water from operations and painting activities must be collected in a designated container and disposed of at a suitable disposal point off site.	▪ Waste removal and disposal to be monitored	▪ Monthly	▪ Facility Manager
D. DECOMMISSIONING PHASE					
D.1. ECOLOGICAL IMPACTS (TERRESTRIAL, AQUATIC AND AVIFAUNA)					
12.46. Exotic weed invasion of abandoned site resulting in ecological change	To prevent the excessive growth and propagation of exotic weeds on disturbed lands that formed portion of the PV facility	12.46.1. Exotic weed control measures to be instituted through weed control programme. 12.46.2. Regular redress of exotic weed through use of herbicide and manual removal.	▪ Compile weed eradication programme for period of 12 months post the decommissioning exercise. ▪ Appoint contractor to undertake weed eradication programme.	▪ Weed eradication exercise to be undertaken every 6 months for a period of 12 months following decommissioning	▪ Project Owner
D.2. VISUAL IMPACTS					
12.47. Potential visual intrusion of decommissioning activities on existing views of sensitive visual receptors.	Prevent unnecessary visual clutter and focusing attention of surrounding visual receptors on the proposed development.	12.47.1. Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes. 12.47.2. Edges of re-vegetated areas should be feathered to reduce form and line contrasts with surrounding undisturbed landscape.	▪ Conduct visual inspections to ensure that landscaping is following the rehabilitation plan.	▪ Weekly	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		12.47.3. Stockpiled topsoil should be reapplied to disturbed areas and these areas should be re-vegetated using a mix of indigenous species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape.	▪ Site visits to ensure that stockpiled topsoil (or appropriate soil for vegetation when stockpiled topsoil is exhausted) is used.	▪ Weekly	▪ ECO
		12.47.4. Night lighting of decommissioning sites should be minimised within requirements of safety and efficiency.	▪ Complaints about night lights should be investigated and documented in a register.	▪ As complaints arise	▪ Contractor and ECO
		12.47.5. Working at night should be avoided where possible.	▪ Operation times for decommissioning activities to be monitored and managed (as well as included in the tender contract).	▪ Weekly	▪ ECO
	Reduce the visual impact of decommissioning activities project wide.	12.47.6. Maintain good housekeeping on site to avoid litter and minimize waste. 12.47.7. Monitor sites for strict adherence to demarcated boundaries. 12.47.8. Monitor adherence to lighting plan. 12.47.9. Monitor adherence to rehabilitation plan. 12.47.10. Monitor adherence to erosion control plan. 12.47.11. Monitor adherence to dust and fire control plans.	▪ Carry out site visits and inspections of the sites and ensure good housekeeping is maintained. Record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance. ▪ Complaints about night lights should be investigated and documented in a register. Investigate any complaints about night lights and document it in a register. ▪ Visit sites requiring rehabilitation.	▪ Daily ▪ Daily ▪ Daily and as complaints arise. ▪ Daily ▪ Daily ▪ Daily	▪ Construction Manager and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
			▪ Carry out site visits and record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance.		
D.3. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)					
12.48. Construction vehicles and activities could result in damage to or destruction of archaeological sites and/or graves.	Minimise the chances of significant archaeological sites and/or graves being disturbed.	12.48.1. Ensure that no activity takes place outside of the authorized construction footprint.	▪ Carry out visual inspections to ensure strict control over the behaviour of construction staff in order to restrict activities to within demarcated areas.	▪ Weekly	▪ ECO
12.49. Scarring of the landscape once infrastructure has been removed.	Ensure that the landscape within the development footprint has a similar appearance to that around it.	12.49.1. Ensure removal of all foundations, construction materials and foreign matter. 12.49.2. Ensure rehabilitation of the site in accordance with environmental guidelines.	▪ Follow the relevant environmental guidelines.	▪ Throughout the decommissioning phase.	▪ ECO
D.4. SOILS AND AGRICULTURAL POTENTIAL IMPACTS					
12.50. Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to decommissioning disturbance and potential	To conserve the surrounding natural veld vegetation.	12.50.1. Minimize footprint of disturbance during the decommissioning phase and ensure that work is undertaken within the demarcated area only. 12.50.2. Confine vehicle access on roads only 12.50.3. Control dust generation during decommissioning activities by implementing standard construction site dust control	▪ Monitor the decommissioning activities via site audits to ensure that they are undertaken within the demarcated decommissioning area, and record non-compliance and incidents. ▪ Include periodic site inspection in environmental performance	▪ Daily ▪ Monthly during the decommissioning phase ▪ Monthly and during complaints/incident s	▪ Contractor and ECO ▪ ECO ▪ Contractor and ECO

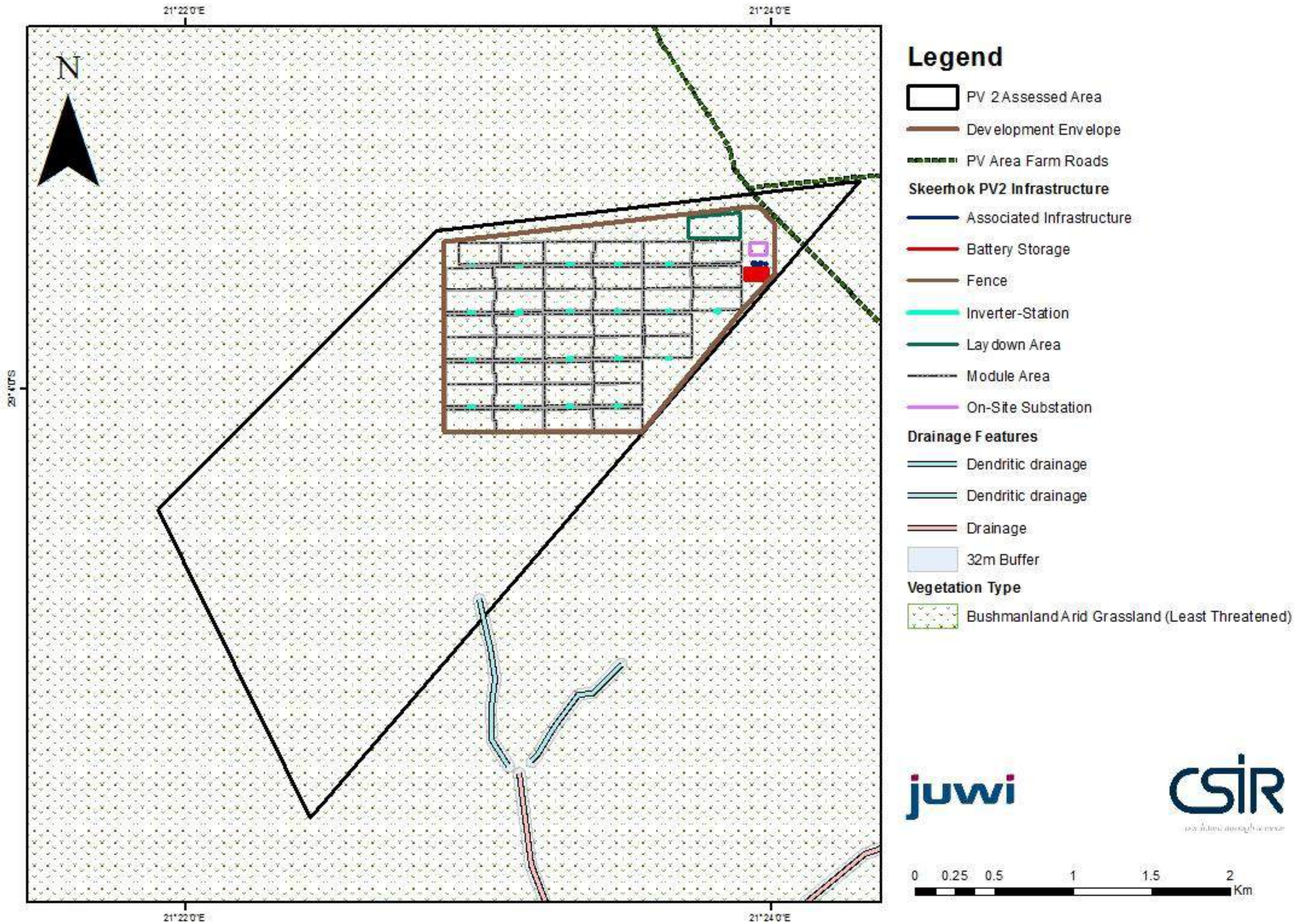
Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
trampling by vehicles.		measures (dampening with water) where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.	reporting that specifically records occurrence or not of off-road vehicle tracks surrounding the site. Monitor via site audits and record non-compliance and incidents. ▪ Monitor dust suppression mechanisms via visual inspections and record non-compliances. Maintain an incidents/ complaints register. The date, time, nature of complaint, name of complainant and corrective actions must be logged for all complaints. Complaints must be investigated and, if appropriate, acted upon.		
12.51. Loss of topsoil due to poor topsoil management.	Ensure effective topsoil covering to conserve soil fertility on all disturbed areas, after they have been rehabilitated.	12.51.1. Strip and stockpile topsoil from all areas where soil (below surface) will be disturbed. 12.51.2. After cessation of disturbance, re-spread topsoil over the surface. 12.51.3. Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	▪ Establish an effective record keeping system for each area where soil is disturbed for decommissioning purposes. These records should be included in environmental performance reports, and should include all the records below: o Record the GPS coordinates of each area. o Record the date of topsoil stripping. o Record the GPS coordinates of where the topsoil is stockpiled.	▪ As needed, dependent on the specifics of decommissioning activities.	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			o Record the date of cessation of decommissioning activities at the particular site. o Photograph the area on cessation of decommissioning activities. o Record date and depth of re-spreading of topsoil. o Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.		
12.52. Soil erosion due to alteration of the land surface characteristics	To reduce erosion on site and downstream of the site as a result of run-off from the site, or due to wind erosion.	12.52.1. Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	▪ Include periodic site inspection in environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	▪ Monthly during the decommissioning phase.	▪ ECO
D.5. SOCIAL IMPACTS					
12.53. Decommissioning of the proposed	Minimise job losses.	12.53.1. The proponent should comply with relevant South African labour legislation when retrenching employees.	▪ Verify that retrenchment practices are compliant with South African labour legislation	▪ Once-off during the decommissioning phase (for mitigation measures	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
development.		12.53.2. The proponent must implement appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning. 12.53.3. All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.	▪ Verify that the proponent implemented succession training of locally employed staff before the plant is decommissioned ▪ Verify that decommissioned infrastructure does not pose any significant risk to the environment or the people living in the environment.	(12.53.1) and (12.53.2) and once-off after decommissioning is completed (for mitigation measure (12.53.3)).	
D.6. GEOHYDROLOGY IMPACTS					
12.54. Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.	To reduce the potential of groundwater pollution.	12.54.1. Avoid using old or damaged equipment and vehicles and ensure that they are well maintained and regularly serviced in order to ensure no leakages. 12.54.2. Any engines that stand in one place for an excessive length of time, must have drip trays, fuel storage tanks should be above ground on an impermeable surface (within a bunded area) and vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the site camp for refuelling activities and drip trays or similar impervious materials must be used during these procedures. If liquid product is being transported it must be ensured this does not spill during transit. 12.54.3. If spillages occur during refuelling, they should be contained and removed as rapidly as possible, with correct disposal of the spilled	▪ Vehicles need to be monitored throughout the decommissioning phase. Monitor via site audits and record non-compliance and incidents. ▪ Monitor the placement and designation of the area for refuelling at the site camp via visual inspections. Monitor the usage of spill containment measures and record and report non-compliance. ▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages.	▪ Four times per annum for the decommissioning period, i.e. at 3 months, 6 months, 9 months and 12 months. ▪ Weekly ▪ Weekly	▪ Contractor and ECO. ▪ Contractorand ECO ▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes. During the operational phase, the same principles should be adhered to. Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.			
D.7. WASTE MANAGEMENT					
12.55. Generation of waste due to disassembly of the solar facility.	Avoid substantial negative impacts at the decommissioning phase due to insufficient planning.	12.55.1. Suitable receptacles must be provided for the temporary storage of various waste types such as scrap metal and concrete, until it is removed to the nearest licensed landfill.	▪ Audit the implementation of mitigation measures recommended for the decommissioning phase.	▪ During the decommissioning phase	▪ ECO
		12.55.2. Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types.	▪ Audit the implementation of mitigation measures recommended for the decommissioning phase.	▪ During the decommissioning phase	▪ ECO

APPENDIX A – COMBINED LAYOUT AND ENVIRONMENTAL SENSTIVITY MAP


21°22'0"E
21°24'0"E
29°4'0"S
N
Legend
PV 2 Assessed Area
Development Envelope
PV Area Farm Roads
Skeerhok PV2 Infrastructure
Associated Infrastructure
Battery Storage
Fence
Inverter-Station
Lay down Area
Module Area
On-Site Substation
Drainage Features
Dendritic drainage
Dendritic drainage
Drainage
32m Buffer
Vegetation Type
Bushmanland Arid Grassland (Least Threatened)
juwi
CSIR
0 0.25 0.5 1 1.5 2
Km

APPENDIX B – ENVIRONMENTAL SENSITIVITY MAP


21°22'0"E
21°24'0"E
29°4'0"S
N
Legend
Project Site Layout
Gemsbok Bult Farm 120 Portion 9
PV 2 Assessed Area
Development Envelope
Drainage Features
Dendritic drainage
Dendritic drainage
Drainage
32m Buffer
Vegetation Type
Bushmanland Arid Grassland (Least Threatened)
0 0.25 0.5 1 1.5 2
Km