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ENVIRONMENTAL IMPACT ASSESSMENT REPORT

for

HUMANSRUS SOLAR 3 PV FACILITY

on

Farm 147 Humansrus, Prieska, Northern Cape

In terms of the

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

Prepared for Applicant: Humansrus Solar 3 (Pty) Ltd

By: *Cape EAPrac*

Report Reference: SIY402/12

Department Reference: 14/12/16/3/3/2/888

Case Officer: Ms Thabile Sangweni

Date: 30 May 2016

APPOINTED ENVIRONMENTAL ASSESSMENT PRACTITIONER:

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Report written & compiled by: **Melissa Mackay** (BTech & ND Nature Conservation), who has ten years' experience as an environmental practitioner.

Report reviewed by: **Dale Holder** (ND Nature Conservation), who has fourteen years' experience as an environmental practitioner.

Registrations: Director, **Louise-Mari van Zyl** (MA Geography & Environmental Science [US]; Registered Environmental Assessment Practitioner with the Interim Certification Board for Environmental Assessment Practitioners of South Africa, EAPSA). Ms van Zyl has over thirteen years' experience as an environmental practitioner.

PURPOSE OF THIS REPORT:

Environmental Impact Assessment phase of the Application for Environmental Authorisation

APPLICANT:

Humansrus Solar 3 (Pty) Ltd

CAPE EAPRAC REFERENCE NO:

SIY402/12

DEPARTMENT REFERENCE:

14/12/16/3/3/2/888

SUBMISSION DATE

30 May 2016

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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

Humansrus Solar 3 PV Facility

Farm 147, Prieska, Northern Cape

Submitted for:

Stakeholder Review & Comment

Report Issued by:

Cape Environmental Assessment Practitioners

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REPORT DETAILS

Title:	**ENVIRONMENTAL IMPACT ASSESSMENT REPORT** **for proposed Humansrus Solar 3 PV Facility**
Purpose of this report:	This EIAR Report forms part of a series of reports and information sources that are being provided during the Environmental Impact Assessment (EIA) for the proposed Humansrus Solar 3 PV Energy Facility, near Prieska, in the Northern Cape Province. In accordance with the EIA Regulations, the purpose of the Environmental Impact Assessment Report is to: • Provide details of the public participation process conducted; • Describe the need and desirability of the proposed activity; • Provide a description of identified potential alternatives, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity; • Provide a description of the methodology used in determining the significance of potential environmental impacts; • Proved a description and comparative assessment of all alternatives identified during the environmental impact assessment process; • Proved a summary and the findings and recommendations of any specialist report or report on a specialised process; • Describe all environmental issues that were identified during the EIA process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed; • Present a reasoned opinion as to whether the activity should or should not be authorised; • Include all relevant specialist reports, Environmental Management Programme and any other required documents for consideration. This Environmental Impact Assessment Report (EIAR) is made available to all stakeholders for a 30 day review & comment period extending from 30 May to 29 June 2016. I&APs are requested to submit their comments in writing to *Cape EAPrac* on or before 29 June 2016. All comments will be collated and included in the final report for submission to the national DEA.
Prepared for:	Humansrus Solar 3 (Pty) Ltd.
Published by:	*Cape Environmental Assessment Practitioners (Pty) Ltd. (Cape EAPrac)*
Authors:	Ms Melissa Mackay
Reviewed by:	Mr Dale Holder
Cape EAPrac Ref:	SIY402/12
DEA Case officer & Ref. No:	*14/12/16/3/3/2/888*
Date:	30 May 2016
To be cited as:	*Cape EAPrac,* 2016. Environmental Impact Assessment Report for the Humansrus Solar 3 PV Facility. Report Reference: SIY402/12. George, South Africa.

ENVIRONMENTAL IMPACT REPORT REQUIREMENTS

The acceptance of the Final Scoping Report by DEA on **4 April 2016** was subject to various conditions and information that must be included in the Draft as well as Final Environmental Impact Report. The checklist below serves as a summary of how these requirements were incorporated into this Final Environmental Impact Report.

Requirement	Description
General Requirements	
Comments from relevant stakeholders are to be included in the Final EIR. These stakeholders must include: Northern Cape Department of Environment and Nature conservation, Department of Agriculture, Forestry and Fisheries (DAFF), provincial Department of Agriculture, South African Civil Aviation Authority (SACAA), Department of Transport, Local Municipalities, District Municipality, Department of Water and Sanitation (DWS), Department of Communications, SENTECH, Eskom Holdings SOC Limited, South African National Roads Agency Limited (SANRAL), South African Heritage Resources Agency (SAHRA), EWT, Birdlife SA, Department of Mineral Resources, Department of Rural Development and Land Reform & Square Kilometre Array (SKA).	All authorities listed have been given an opportunity to comment on all reports that formed part of this environmental process. State departments who fail to submit comments within the allocated timeframe are deemed to have no comments. Any comments received from these authorities during the 30 day comment period will be included in the final EIAR to be submitted to DEA.
An A3 regional map of the area and the site layout must be included.	This is attached in **Appendix A & D** of this report.
Specific Requirements	
i. Ensure that all relevant listing notice activities applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	The EIAR has considered the 2014 EIA Regulations listing notices applicable to the development. See Section 2.2.
ii. The application form must be amended and resubmitted to department to reflect the changes to activities that were considered and assessed	An amended application will be submitted as an additional Appendix to the National Department of Environmental Affairs with the final EIAR to ensure that all listed activities are captured correctly.
iii. Written comment from the provincial department of environmental affairs that the activities applied for under GN546 apply. In addition, a graphical representation of the proposed development within the respective geographical area must	The Northern Cape Department of Environment and Nature conservation, Department of Agriculture were given an opportunity to comment on the Draft as well as the Final Scoping Report and will be given further opportunity to comment on this report.

Requirement		Description
	be provided.	
iv.	The EIR must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Please refer to the impact assessment summaries and the specialist impact assessment reports. See Sections 6 and 17.
v.	The technical details of the proposed activity must be provided in a table format as well as the description and / or demission.	Please see the **Overview** section of this report.
vi.	Provide the four corner's coordinates for the proposed development site.	The coordinate points for the preferred layout, Alternative 1 is as follows: NW corner: 22˚22'45"E / 29˚58'27"S NE corner: 22˚23'38"E / 29˚58'20"S SW corner: 22˚22'31"E / 29˚58'59"S SE corner: 22˚23'38"E / 29˚59'12"S Please see **Appendix D** for the graphic representation.
vii.	The total footprint of the proposed development should be indicated. Exact locations of the PV positions, power lines and associated infrastructure should be mapped at an appropriate scale.	Various plans in this regard are attached in **Appendix D.**
viii.	Conduct a surface hydrological study.	It has been determined that the Humansrus Solar 3 PV Energy Facility will not impact on any significant hydrological resources. An Aquatic Delineation & Impact Assessment was undertaken by Scherman Colloty & Associates. The Aquatic Assessment is included as **Annexure E4** and captured in this EIAR in Sections 10 and 17.4 A Water Use License Application was submitted to DWS for potential crossings of washes identified on the site. DWS has confirmed that the application will not be processed any further unless a letter is received from DoE confirming that the project is given preferred bidder status. Confirmation of the submission of the WULA is included as **Annexure H2**.
ix.	Conduct an agricultural potential study.	An Agricultural Impact Assessment has been included as **Annexure E1** and captured in this EIAR as Sections 7 and 17.1
x.	Specialist studies must include the assessment of cumulative impacts.	The specialists have considered the cumulative impacts of the activity. Please see the reports in **Appendix E**. The assessments are also

Requirement		Description
		captured in this EIAR in Sections 6 – 15 and summarised in Section 17.
xi.	The SKA must provide comment and input into the EMI and RFI studies. The studies must take into consideration the cumulative impacts of the other facilities approved and proposed in the area.	SKA has been included as a commenting authority. The EMI / RFI Path Loss report has been provided to them for comment.
xii.	The EIAr must include a comments and responses report.	Please see **Annexure F5**.
xiii.	The EIAr must include the detail inclusive of the PPP in accordance with Regulation 54 of the EIA Regulations.	Please refer to Public Participation sections in the report and Appendix F.
xiv.	Details of the future plans for the site and infrastructure after decommissioning in 20 – 30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	Once the facility has reached the end of its economic life, the infrastructure is to be decommissioned. The decommissioning of the facility would entail the disassembly and replacement of components with other appropriate technologies. However, if not deemed so, then the facility would be completely decommissioned. This must comply with relevant legislation at that time.
xv.	An Avifaunal Assessment must be conducted to determine the impacts that the proposed activity (including the powerline) may have on avifauna. Mitigation measures must be proposed and included in the EIAr and the EMPr.	An Avifaunal Assessment has been undertaken and included as **Annexure E3**. This report has also been captured in the EIAR in Sections 9 and 17.3
xvi.	Should a Water Use License be required, proof of application for a license needs to be submitted.	A Water Use License Application was submitted to DWS for potential crossings of washes identified on the site. DWS has confirmed that the application will not be processed any further unless a letter is received from DoE confirming that the project is given preferred bidder status. Confirmation of the submission of the WULA is included as **Annexure H2**.
xvii.	Information on services required on site e.g. sewerage, 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.	Details of the services required are contained in the engineering report attached in **Annexure E9.** The Siyathemba Municipality has confirmed provision of services where applicable. See **Annexure H3 and H4**.
xviii.	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	Please see Section 3 in the Overview and Section 1.1 in the main report. Furthermore, a Socio-Economic Impact Assessment has been included as Annexure E13 and the assessment has been captured in

Requirement		Description
	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.	this EIAR in Sections 15 and 17.9
xix.	A copy of the final site layout map. All available biodiversity information must be used in finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads.	This Plan is attached in **Appendix D**.
xx.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	This Plan is attached in **Annexure D2**.
xxi.	A map combining the final layout map superimposed on the environmental sensitivity map	This Plan is attached in **Annexure D2**.
xxii.	A shape file of the preferred development layout	Shapefiles showing the development layout are included on the **CD** attached to this report.
The Environmental Management Programme must include the following.		
i.	All recommendations and mitigation measures recorded in the EIR and the specialist studies conducted.	This is captured as Section 4 of the EMPr, it is further dealt with throughout the EMPr, and is summarised in sections 5 - 11 of the document.
ii.	The final site layout map	Attached in **Appendix A** of the EMPr.
iii.	Measures as dictated by the site layout map and micro siting.	Attached in **Appendix A** of the EMPr.
iv.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	The environmental sensitivity map is attached in **Appendix A** of the EMPr.
v.	A map combining the final layout map superimposed on the environmental sensitivity map.	The sensitivity overlays are attached in **Appendix A** of the EMPr.
vi.	An Alien Invasive Management Plan to be implemented during construction and operation of the facility.	An Alien Invasive Management Plan is included in the EMPr documents as Appendix F and in this EIAR as **Annexure G2.**
vii.	A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be	A Plant Rescue and Protection Plan is included in the EMPr as Appendix D and in this EIAR as **Annexure G4.**

Requirement		Description
	transformed.	
viii.	A re-vegetation and habitat rehabilitation plan to be implemented during construction and operation	A Re-vegetation and Rehabilitation plan is included in the EMPr as Appendix E and in this EIAR as **Annexure G5.**
ix.	An open space management plan to be implemented during the construction and operation of the facility	An Open Space Management Plan is included in the EMPr as Appendix G and in this EIAR as **Annexure G3.**
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.	A traffic management plan is included in the EIAR in **Annexure E11**.
xi.	A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment.	A Transportation plan is included in the EIAR in **Annexure E11**.
xii.	A stormwater management plan to be implemented during the construction and operation of this facility.	A Stormwater, Erosion and Washwater Management Plan is included in the EMPr as Appendix B and in this EIAR as **Annexure G6.**
xiii.	A fire management plan to be implemented during the construction and operation of the facility.	Fire management requirements are included in Section 6.13 of the EMPr.
xiv.	An erosion management plan for monitoring and rehabilitating erosion events associated with the facility.	A Stormwater, Erosion and Washwater Management Plan is included in the EMPr as Appendix B and in this EIAR as **Annexure G6.**
xv.	An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage.	The development and operation of this facility does not include the transport, handling or use of any hazardous substances.
xvi.	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments.	The Aquatic specialist has made recommendations to protect the hydrological resources on site. These recommendations are included in the EMPr in Section 4.4 and summarised throughout the report where applicable. The Aquatic Delineation & Impact Assessment Report is attached in this EIAR **Annexure E3**.

A: EIA INFORMATION REQUIRED FOR SOLAR FACILITIES	
1. General Information	
Description of the affected farm portions	**Remainder of the Farm Humansrus 147.**
21 digit Surveyor General codes of all affected farm portions	**C06000000000014700000**
Copies of deeds of all affected farm portions	The Windeed Property Report for Remainder of Humansrus 147 is attached in **Annexure J2.**
Photos of areas that give a visual perspective of all parts of the site.	A full photographic record of the site is attached in **Appendix C.**
Photographs from sensitive visual receptors (tourism routes, tourism facilities etc.)	There are no sensitive visual receptors surrounding the property. Please see the Visual Statement attached as **Annexure E8.**
Solar plant design specifications	The design specifications of the facility are detailed in the Engineering Report attached in **Annexure E9**. They are also summarised in Section 1 in the Overview of this EIAR.
Type of technology	Photovoltaic (PV) (including both conventional PV as well as Concentrated PV).
Structure height	Maximum of 10m
Surface area to be covered (incl. associated infrastructure)	220ha
Structure orientation	North facing
Laydown area dimensions (construction period & thereafter)	Approximately 2-5ha of laydown area will be required (the laydown areas will not exceed 5ha.)
Generation capacity	Net generating capacity (AC) of 75MW, Installed capacity (DC) of +/-87MW.
Generation Capacity of the Facility as a whole at delivery points	The facility will have a maximum generating capacity of **75 Megawatts**.
2. Technical Details	
Height of PV panels	Less than 10m
Area of PV array	Approximately 180ha
Number of inverters required	Approximately 75 inverter stations
Area occupied by inverter / transformer stations / substations	Inverters area = 2000m²; onsite substation approximately 1 ha.
Capacity of on-site substation	Approximately 180MW
Area occupied by both permanent and construction laydown areas	Approximately 5ha
Area occupied by buildings	Buildings area estimated 1300m², total area of approximately 2ha.
Length of internal roads	Approximately 25km

Width of internal roads	<6m
Proximity to grid connection	Approximately 6km
Height of fencing	Less than 3m
Type of fencing	Perimeter security fencing
3. Site Maps and GIS information	
All maps and information layers must also be provided in ESRI Shapefile format.	All Shapefiles (layout, cadastral units, biodiversity and sensitivity layers) are included in the **CD** attached to this report.
All affected farm portions must be indicated	The affected farm portions are indicated on all maps and plans.
The exact site of the application must be indicated.	The exact site is indicated on all maps and plans.
A Status Quo Map must be provided that includes the following: - Current land use of the site, o Buildings & other structures o Agricultural fields o Grazing areas o Natural vegetation areas with an indication of the vegetation quality as well as fine scale mapping in respect of CBAs and ESAs o Critically endangered and endangered vegetation areas that occur on the site o Bare areas which may be susceptible to erosion o Cultural historical sites and elements - Rivers streams and watercourses; - Ridgelines and 20m continuous contours; - Fountains, boreholes, dams and reservoirs; - High potential agricultural areas, and - Buffer Zones o 500m from any irrigated agricultural land o 1km from residential areas - Indicate isolated residential, tourism facilities on or within 1km of the site.	This is included in the regional land use plan attached in **Appendices A B and D.**
Slope Analysis map/layer that includes the following slope ranges:	Attached in **Annexure E6.**

- Less than 8% slope. - Between 8% and 12% slope. - Between 12% and 14 % slope. - Steeper than 18% slope.	
Site Development proposal map that indicates: - Foundation footprint, - Permanent laydown area, - Construction period laydown area, - Internal roads indicating width (construction period width and operation period width), - River, stream and water crossings of roads and cables indicating the type of bridging structures that will be used, - Substations and/or transformers sites, - Cable routes and trench dimensions, - Connection routes to the distribution/transmission network, - Cut and fill areas along roads and at substation/transformer sites indicating the expected volume of each cut and fill, - Borrow pits, - Spoil heaps, and - Buildings including accommodation.	These items are indicated on the series of plans attached in the Layout Report Attached in **Appendix D2**.
4. Regional map and GIS information	
All maps must be provided in ESRI shape file format.	ESRI Shapefiles are included on the attached **CD**.
The map/layer must cover an area of 20km around the site.	All cadastral and regional biodiversity data contains a 20km buffer of the site.
Indicate the following on the Map: - Roads including type and category, - Railway lines and their stations, - Industrial areas, - Harbour and Airports, - Electricity transmission and distribution lines and substations, - Pipelines, - Water Sources to be utilised during construction and operation,	These are indicated on the topographical plan in **Appendix A** as well as the Biodiversity overlays in **Appendix B** and the spatial development plan in **Appendix D**.

- Visibility Assessment, - Critical Biodiversity Areas and Ecological Support Areas, - Critically endangered and Endangered vegetation areas, - Agricultural fields, - Irrigated Areas, and - New Roads and upgrades to existing roads.	
5. Important stakeholders	
Amongst others, comments from the National Department of Agriculture, Forestry & Fisheries must be obtained and submitted to the DEA.	These authorities were included in the Scoping phase of this process and have again been requested to submit their comments on this EIAR. All comments received will be collated and included in the final EIAR for submission to DEA.
Comments must be requested from Eskom regarding grid connectivity and capacity.	Eskom has been included as a stakeholder and comment will be requested. A grid feasibility application will be submitted to ESKOM, in order to confirm the connection possibilities of this project. A formal investigation and application as part of the ESKOM Cost Estimate will run in parallel to this environmental process.
B: AGRICULTURAL STUDY REQUIREMENTS	
Detailed Soil Assessment of the site including the following: - Identification of soil forms present, - 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, and - Size of the site	A full agricultural potential study and Impact Assessment was undertaken and this is included in **Annexure E1**. The assessment is further captured in this EIAR as Sections 7 and 17.1.
Exact locality of the site.	The proposed development will take place on a portion of the farm Humansrus 147 east of Prieska in the Northern Cape. Details are provided in the study site description of this report as well as on all plans attached in

	Appendix A, B, D and **Specialist Reports.**
Current activities on the site, developments, buildings	These are indicated on the Topographical plans attached in **Appendix A.**
Surrounding developments / land uses and activities in a radius of 500m of the site.	These are indicated on the Regional plans attached in **Appendix A**
Access routes and the condition thereof.	These are indicated on the Solar Facility Layout Plans and the Layout Report attached in **Appendix D**.
Current status of the land (including erosion, vegetation and a degradation assessment).	The land is currently **vacant** and is marginally used for **livestock grazing**.
Possible land use options for the site.	These are considered in the Agricultural Potential Study attached as **Annexure E1** of this report.
Water availability, source and quality.	This is detailed in the Agricultural Potential study attached in **Annexure E2**, the Aquatic Assessment attached as **Annexure E4**, the Engineering Report attached as **Annexure E9** and the confirmation of services in **Annexures H3 and H4**.
Detailed descriptions as to why agriculture should or should not be the land use of choice.	These are included in the Agricultural Impact Assessment attached in **Annexure E1**.
Impact of the change in land use of the surrounding area.	This is detailed from different disciplines in the specialist Impact Assessments included as **Appendix E**.
A Shapefile containing the soil forms and relevant attribute data.	The Shapefiles of the soil forms are included on the **CD** attached to this report.
C: ASTRONOMY GEOGRAPHIC ADVANTAGE ACT, 2007	
Indicate the applicability of the Astronomy Geographic Advantage Act.	The assessment confirmed that the nearest SKA station has been identified as **SKA station ID 1899**, at approximately 17km from the proposed installation; Based on distance to the nearest SKA station, and the information currently available on the detailed design of the PV installation, this facility poses a potential high level risk of detrimental impact on the SKA. An EMI/RFI Path Loss Report has been included in **Annexure E12** of this EIAR. This report has been provided to Dr Adrian Tiplady of SKA for comment.
Obtain comment from the South African Large Telescope (SALT) if the proposed development is situated within a declared astronomy	The project is situated outside of the defined buffer from SALT. The information provided by SKA, indicates that Humansrus Solar 3 PV

Advantage Area.	Facility is not situated in a declared astronomy advantage area.

ORDER OF REPORT

Overview

Environmental Impact Assessment Report

Appendix A : Location & Topographical Maps

Appendix B : Biodiversity Maps (Vegetation, NFEPA, NPAES)

Appendix C : Site Photographs

Appendix D : Facility Layout Alternatives and Report

Annexure D1 : Layout Maps

Annexure D2 : Engineering Layout Report

Appendix E : Specialist Reports

Annexure E1 : Agricultural Impact Assessment Report

Annexure E2 : Ecological Impact Assessment Report

Annexure E3 : Avifaunal Impact Assessment Report

Annexure E4 : Aquatic Delineation & Impact Assessment Report

Annexure E5 : Integrated Heritage Impact Assessment Report

Annexure E6 : Archaeological Impact Assessment Report

Annexure E7 : Paleontological Report

Annexure E8 : Visual Statement

Annexure E9 : Engineering Report

Annexure E10 : Geotechnical Statement

Annexure E11 : Traffic Impact Assessment

Annexure E12 : EMI/RFI Path Loss Report

Annexure E13 : Socio-Economic Impact Assessment

Appendix F : Public Participation Process

Annexure F1 : Registered I&AP List

Annexure F2 : Scoping Public Participation and Comment

Annexure F3 : EIAR Notification

Annexure F4 : EIAR Comments Received (Pending)

Annexure F5 : Issues & Responses Table

Appendix G : Environmental Management Programmes

Annexure G1	:	Environmental Management Programme (EMPR)
Annexure G2	:	Alien Management Plan
Annexure G3	:	Open Space Management Plan
Annexure G4	:	Plant Rescue & Protection Plan
Annexure G5	:	Revegetation & Rehabilitation Plan
Annexure G6	:	Stormwater, Erosion and Washwater Management Plan
Appendix H	:	Authority Correspondence
Annexure H1	:	DEA Correspondence
Annexure H2	:	Confirmation of WULA submission
Annexure H3	:	Provision of water (Siyathemba Municipality & Alkantpan)
Annexure H4	:	Provision of services (Siyathemba Municipality)
Appendix I	:	EAP Curriculum Vitae & Declaration
Appendix J	:	Additional Information
Annexure J1	:	Landowners Consent
Annexure J2	:	Title deed / Windeed Property Report
Appendix K	:	Amended Application Form (pending)

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PHOTOGRAPHS

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ABBREVIATIONS

AC	Alternating Current
AIA	Archaeological Impact Assessment
BGIS	Biodiversity Geographic Information System
ºC	Degree Centigrade
CARA	Conservation of Agricultural Resources Act (43 of 1983)
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry & Fisheries
DC	Direct Current
DEA	Department of Environmental Affairs (national)
DEANC	Department of Environmental Affairs & Nature Conservation (Northern Cape)
DEIR	Draft Environmental Impact Report
DME	Department of Minerals and Energy
DMR	Department of Mineral Resources
DoE	Department of Energy
DSR	Draft Scoping Report
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Impact Practitioner
ECO	Environmental Control Officer
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMF	Environmental Management Framework
EMI	Electromagnetic Interference
EMPr	Environmental Management Programme
FEIR	Final Environmental Impact Report
FPA	Fire Protection Association
FSR	Final Scoping Report
GPS	Global Positioning System
GWh	Giga Watt hour
Ha	Hectare
HIA	Heritage Impact Assessment
Lt	Litre
LUDS	Land Use Decision Support
LUPO	Land Use Planning Ordinance
M	Metre
m²	Metres squared
m³	Metres cubed
MW	Mega Watt
NCHRA	Northern Cape Heritage Resources Authority
NCNCA	Northern Cape Nature Conservation Act (9 of 2009)
NEMA	National Environmental Management Act (107 of 1998, as amended in 2006)
NEMBA	National Environmental Management: Biodiversity Act (10 of 2004)
NERSA	National Energy Regulator of South Africa
NFA	National Forest Act (84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Act
NHRA	National Heritage Resources Act (25 of 1999)
NPAES	National Protected Area Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NVFFA	National Veld and Forest Fire Act (101 of 1998)
NWA	National Water Act (36 of 1998)
PIA	Paleontological Impact Assessment
PM	Post Meridiem; “Afternoon”
PSDF	Provincial Spatial Development Framework
PV	Photovoltaic
PVC	Polyvinyl Chloride (piping)
RFI	Radio Frequency Interference
SA	South Africa
SACAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
SEF	Solar Energy Facility

I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPP	Independent Power Producer
ISO	International Organisation for Standardisation (ISO 9001)
Kl / Klt	Kilo Litre
Km	Kilometre
S&EIR	Scoping & Environmental Impact Reporting
SKA	Square Kilometre Array
TIA	Transport / Traffic Impact Assessment
TOPS	Threatened and Protected Species
VIA	Visual Impact Assessment

OVERVIEW

1 TECHNICAL CHECKLIST

The following technical checklist is included for ease of reference.

Company Details		
Company profile	Name and details of Developer	Humansrus Solar 3 (Pty) Ltd is a special purpose vehicle company, created with the sole purpose of the proposed solar development on a portion of Farm 147 Humansrus. The facility aims to produce renewable energy under the REIPPP program.
Site Details		
Property Details	Farm portion and 21 Digit Reference	Farm 147 Humansrus C06000000000014700000
Size of the site	Description and Size in hectares of the affected property.	Farm 147 Humansrus is 4769ha in total.
	Zoning	Agriculture
Development Footprint	This includes the total footprint of PV panels, auxiliary buildings, onsite substation, inverter stations and internal roads.	Initial Study Area is 852ha. The total development footprint of Humansrus Solar 3 PV Facility will not exceed 220ha
Site co-ordinates	Site co-ordinates of the four corners of the preferred layout	NW corner: 22˚22'45"E / 29˚58'27"S NE corner: 22˚23'38"E / 29˚58'20"S SW corner: 22˚22'31"E / 29˚58'59"S SE corner: 22˚23'38"E / 29˚59'12"S
Technology Details		
Capacity of the facility	Capacity of facility (in MW)	Net generating capacity (AC) of 75MWp, Installed capacity (DC) of +/-90MWp.
Solar Technology selection	Type of technology	PV and/or concentrated PV with fixed, single or double axis tracking technology.
	Capacity and dimensions of	75 MWp AC yield.

	the PV field	Facility footprint of not more than 220ha.
	Structure height	Less than10 meters
	Surface area to be covered (including associated infrastructure such as roads)	Approximately 220 ha.
	Structure orientation	North-facing
	Laydown area dimensions	Approximately 2-5ha of laydown area will be required (the laydown areas will not exceed 5ha.)
Grid Connection Details		
Grid Connection Property Details		
Property Details	Farm portion and 21 Digit Reference for possible grid connection routes.	Farm 147 Humansrus C06000000000014700000
		Farm 146 Hoekplaas C06000000000014600000
		Portion 7 of Farm 117 Klipgatspan C06000000000011700007
Grid connection	Substation to which project will connect.	There are two substations within the surrounding area namely Kronos and Cuprum. The facility plans to connect to Kronos substations via a self-built 132kV line.
Power line/s	Number of overhead power lines required	1x132kV line from the on-site grid substation to Kronos.
	Route/s of power lines	Selfbuild powerline grid connection options from the onsite substation to Eskom's Kronos substation as per the identified route (see Section 3.3.2).
	Voltage of overhead power lines	132kV expected.
	Height of the Power Line	<25m heights are expected for monopole steel structures.
	Servitude Width	32m or more.
Site co-ordinates	Site co-ordinates of the start, middle and end of the grid connection for the preferred layout	Grid start: 22˚22'36"E / 29˚58'58"S Grid middle: 22˚21'28"E / 30˚00'06"S Grid end: 22˚20'20"E / 30˚01'25"S

Auxiliary Infrastructure		
Other infrastructure	Additional Infrastructure	Auxiliary buildings of approximately 2ha. The functions within these buildings include (but not limited to) to ablution, workshops, storage areas and site offices. Perimeter Fencing not exceeding 5m.
	Details of access roads	Access roads approximately 6m but not exceeding 8m in width. The length of these access roads is dependent on the specific scenarios, as depicted within the layouts.
	Extent of areas required for laydown of materials and equipment	Approximately 2-5ha of laydown areas will be required, but will not exceed 5ha.

2 PROJECT OVERVIEW

Cape EAPrac has been appointed by **Humansrus Solar 3 (Pty) Ltd.**, hereafter referred to as the Applicant, as independent environmental practitioner responsible for facilitating the Scoping & Environmental Reporting (S&EIR) process as part of the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act (NEMA, Act 107 of 1998, as amended) for the proposed **Humansrus Solar 3 PV Facility**, near Prieska, Northern Cape.

The Applicant has sub-leased a portion of Farm 147 Humansrus from the landowner, Mrs Christina S. Human, for the purposes of developing the proposed solar facility.

The project involves the development of a solar-energy facility with a total generation capacity of approximately **75MW renewable electricity** to be supplied to the national Eskom grid via the existing Kronos Substation, adjacent to the site. The project infrastructure covers an area of up to **220ha.** The necessary associated infrastructure, including access roads, overhead electric lines, substation and control building(s) form part of this application.

3 NEED AND DESIRABILITY

The supply of electricity in South Africa has become constrained, primarily because of insufficient generation capacity, but also due to constraints on the transmission and distribution of electricity. Considering this situation and the impact that carbon emissions from existing (and future) coal-fired power stations have on the environment (Climate Change), this **renewable energy project** will contribute to the generation of 'clean' or so-called 'green' electricity for input into the national grid to augment Eskom's power supply.

The South African Government has set a 10 year cumulative target for renewable energy of 10 000GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro power (White Paper on Renewable Energy Policy, 2003). This amounts to approximately 4% (1667MW) of the total estimated electricity demand (41 539MW) by 2013. The majority of this power will be generated by Eskom. However, in order to meet the increasing power demand within the country, Eskom has set a target of 30% of all new power generation to be derived from **independent power producers** (IPPs).

Humansrus Solar 3 (Pty) Ltd is one such IPP which intends to generate electricity from the proposed **Humansrus Solar 3 PV Facility**. This will contribute to South Africa's commitment to the Convention on Climate Change through emission-free generation of electricity and working towards an investor-friendly climate in the energy sector.

It must be noted that the proposed site forms one of many solar and wind projects that make up the renewable energy node that has developed at Copperton.

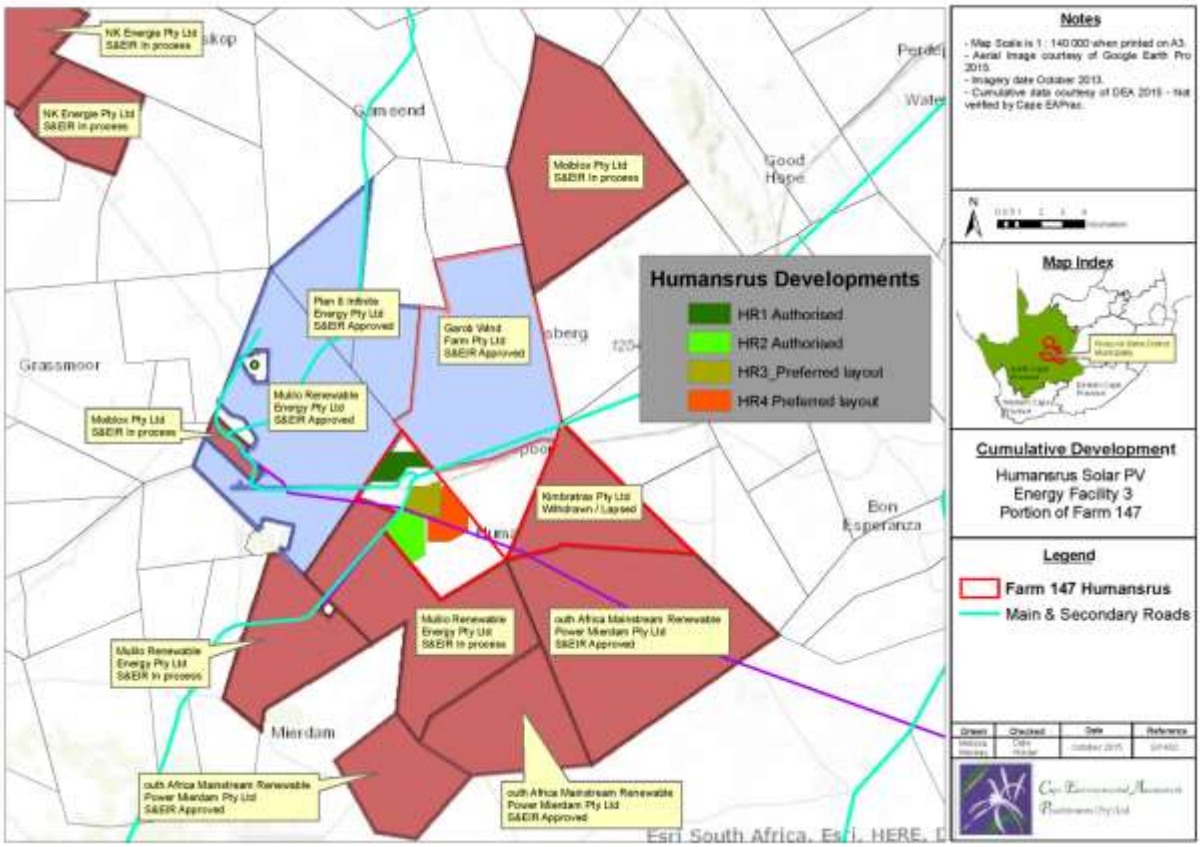


Figure 1: Copperton Renewable Energy node

4 NEMA REQUIREMENTS

The proposed solar energy facility project is subject to the requirements of the Environmental Impact Assessment Regulations (2014 EIA Regulations) in terms of the **National Environmental**

Management Act (NEMA, Act 107 of 1998, as amended)[1]. This Act makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the competent authority (in this case, the national Department of Environmental Affairs, DEA) based on the findings of an EIA. An application for authorisation will be submitted to DEA.

A Scoping and Environmental Impact Assessment process is required in terms of NEMA, 2014. The listed activities associated with the proposed development, as stipulation under Regulations 983, 984 and 985, are as follows:

Regulation 983 (Basic Assessment): Activities 12(x) & (xi) and 19(i);

Regulation 984 (Scoping & EIA): Activities 1 & 15;

Regulation 985 (Basic Assessment): Activity 18(a)(ii) & (ii).

Before any of the above mentioned listed activities may be undertaken, authorisation must be obtained from the relevant competent authority, in this case, the **National Department of Environmental Affairs** (DEA).

5 BROAD CONTEXT

The target property, Farm 147 Humansrus, is located in the Pixley ka Seme District of the Northern Cape Province, within the jurisdiction area of the Siyathemba Local Municipality. The property is approximately 4769ha in extent and is located approximately 50km south-west of the town of Prieska, and approximately 10km east of Copperton.

The proposed solar development site is situated adjacent to the R357 Provincial Road, approximately 9km east of the existing Cuprum Substation and approximately 6km north east of the existing Kronos Substation.

6 SITE DESCRIPTION

The area of land designated for the proposed Humansrus Solar 3 PV Facility, associated with the lease agreement with the landowner, is approximately 220ha in size within an 852ha study area and located in the middle portion of the Farm 147 Humansrus, south of the R357.

The 852ha study area has been assessed by the various specialists to identify sensitive areas which may pose as site constraints to the proposed solar development. These site constraints will be considered and avoided as far as possible in the design of the proposed development site.

The proposed development area is a generally flat, undulating plain of low dunes of red Kalahari sands interspersed with gravel and stony plains. Soils are generally shallow silty soils which favour shrubs over grasses which usually dominate on more sandy soils. Towards the northern margin of the site, there are some deeper soils present with taller, more dense vegetation present. There are also some patches of deeper or more coarse soils present which are dominated by grasses. There are no significant rocky outcrops or large drainage lines within the proposed development area itself, although these features are present within the broader area.

[1] On 4th December 2014 the Minister of Environmental Affairs promulgated new regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA, Act 107 of 1998, as amended), viz, the Environmental Impact Assessment (EIA) Regulations 2014. These regulations came into effect on 8th December 2014 and replace the EIA regulations promulgated in 2010 and 2006.

According to the national vegetation map (Mucina & Rutherford 2006), the site straddles two vegetation types, Bushmanland Arid Grassland in the east and Bushmanland Basin Shrubland in the west. These are both extensive vegetation types that have not been impacted to a large degree by transformation and are classified as Least Threatened.

7 DEVELOPMENT PROPOSAL & ALTERNATIVES

The proposed Humansrus Solar 3 PV Facility is to consist of solar photovoltaic panels with a generation capacity of 75MW$_{AC}$ (MegaWatts - Alternating Current) (86.25MW$_{DC}$ Direct Current), as well as associated infrastructure, which will include:

- On-site switching-station / substation
- Auxiliary buildings (gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.)
- Inverter-stations, transformers and internal electrical reticulation (underground cabling);
- Access and internal road network;
- Laydown area;
- Overhead electrical transmission line / grid connection (connect to existing Kronos Substation);
- Rainwater tanks; and
- Perimeter fencing

Various alternatives, in terms of technology of the solar arrays, as well as layout for the solar arrays and associated infrastructure on the development site, will be considered and be informed by the environmental constraints identified and assessment by the various specialists as part of the on-going environmental.

The following conceptual and preliminary layout alternatives, as well as the no-go option, are currently being considered for the Humansrus Solar 3 PV Facility:

- **Alternative 1 –Preferred Layout** proposes a footprint of no more than 220ha within the 852ha study site. This Alternative has been developed taking into consideration the ecological constraints identified for Humansrus 1 and Humansrus 2 projects, as well as those for identified by the various specialists as part of this EIA process.
  This layout has considered the following:
    - Area of approximately 220 ha , to ensure the project would be economically viable, allowing for exclusions of environmental sensitive areas;
    - Minimal disturbance to water washes and highly sensitive areas;
    - Road access to the site with regard to distance and minimal disturbance to sensitive areas;
    - Grid connection to Kronos taking into consideration minimal distance and minimal disturbance to sensitive areas.

Alternative 1 has considered preliminary site constraints and incorporated site specific constraints / significant environmental sensitive areas identified by the various specialists as part of their impact assessments.

- **Alternative 2 – Secondary Layout,** is an area of approximately 240ha in size and concentrated in the western portion of the abovementioned 852ha study site. This layout has the same aspects as Alternative 1:

- Area of approximately 240 ha , to ensure the project would be economically viable, allowing for exclusions of environmental sensitive areas;
- Minimal disturbance to water washes and highly sensitive areas;
- Road access to the site with regard to distance and minimal disturbance to sensitive areas;
- Grid connection to Kronos taking into consideration minimal distance and minimal disturbance to sensitive areas.

Alternative 2 has considered preliminary site constraints, similar to those of Alternative 1, and has incorporated site specific constraints / significant environmental sensitive areas identified by the various in their impact assessments. The impacts rate similarly to Alternative 1, but the constraints mean that the footprint area is larger to accommodate the sensitive features identified by the specialists. These exclusionary areas create a fragmented development footprint, which although viable is not preferred by the Applicant.

- **NO-GO / Status-Quo Alternative**, which proposes that the Humansrus Solar 3 PV Facility not go ahead and that the farm remain undeveloped as it is currently. This alternative will serve as the baseline against which all development alternatives will be assessed.

In the event that the scoping/impact assessment process identify any other feasible/reasonable alternatives other than the above, such will be considered and incorporated as additional alternatives.

8 SPECIALIST STUDIES

The following aspects have been considered by specialists in order to determine the current status of the target development site, as well as to identify potential risks and constraints associated with the development of the renewable energy facility. These are described in greater detail in the Main Report, while the full specialist reports are attached in **Appendix E**.

The following specialist studies have been undertaken and used to inform this EIAR, as well as the project layout and concept:

8.1 AGRICULTURE

The farm has a **very low grazing capacity at 31 to 40 hectares per large stock unit (LSU)**. The combination of extreme climatic conditions and poor soil properties combination makes the site largely **unsuitable for cultivation**. Due to the low agricultural potential there are **few possible impacts** on agricultural activities during construction and operation of the proposed PV power plant. The loss of the small area of grazing land is negligible. The method of anchoring the structures with **hammered piled foundations**, avoids the use of blasting which would have large impact on the area. On the deeper soils, normal foundations would have no effect after rehabilitation. The proposed solar power plant will have minimal impacts on agriculture, locally and on site, and will have **very little influence on the current commercial farming of the area**. (Lubbe, 2016).

8.2 BIOPHYSICAL

No features of very high sensitivity were identified within the Humansrus Solar 3 PV Facility site. The major impacts associated with the development of a solar energy facility at the site, would be l**ocal habitat loss and the disruption of landscape connectivity**. As there are a number of other approved and proposed renewable energy projects in the area, the potential for

cumulative impacts on vegetation and fauna required further investigations during the EIA phase of the assessment. Listed bird species such as bustards have been observed to be common in the area and are likely to be using the site. Although the site does not appear to be particularly important for such species, avifaunal monitoring before the EIA phase will be an important activity to establish the significance of the area for avifauna as well as identify the most appropriate mitigation and avoidance measures in context of the site.

Overall, there do not appear to be any impacts that are likely to be associated with the development of the Humansrus Solar 3 PV Facility project that cannot be mitigated to a **relatively low level** and most impacts are likely to be of **moderate to low significance** and of local extent. (Todd, 2016).

8.3 AVIFAUNAL

Up to 140 bird species are known to occur within the study area and broader impact zone of the development, including 11 red-listed or threatened species, 18 endemic species and 33 near-endemic species. The birds of greatest potential relevance and importance in terms of the possible impacts of the solar energy facility and its associated power infrastructure are likely to be local populations of endemic passerines, shy ground-nesting species, resident or visiting large terrestrial birds, resident or passing raptors and transient waterbirds.

The development will pose several impacts to avifauna, including: a **medium-low displacement impact** caused by disturbance and habitat destruction associated with construction and maintenance activities off the proposed “Solar Energy Facility” (SEF) and its associated power infrastructure and a low impact of electrocutions of birds on power infrastructure and avian collisions with power line infrastructure and solar panels, with the implementation of mitigation measures.

The study area and more specifically the recommended development area are not considered unique habitats in the landscape and are already subject to varying degrees of transformation and degradation. Although two threatened and/or priority species were recorded on-site – Kori Bustard and Karoo Korhaan –the area is not considered critical for their conservation and the extent of habitat loss for these species would be considered low.

The proposed Humansrus Solar 3 PV Facility and its associated power infrastructure has been assessed as having a **medium-low impact** to priority species and general avifauna occurring in the study area and broader impact zone of the development and it has been recommended that the preferred site layout option be used for the development. (Zoghby, 2016)

8.4 FRESHWATER

The proposed layout for the solar energy facility will have a **negligible impact** on the aquatic environment. The project has adhered to past specialist recommendations and the infrastructure that would have posed even a slight risk to water resources has been moved outside of any direct wetlands or water course areas.

Furthermore, during the site visit, no aquatic protected or species of special concern (fauna & flora) were observed within the adjacent areas that will be used. Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be **LOW**. This would apply to any of the proposed alternatives as they would present a similar impact on the aquatic environment. (Colloty, 2016)

8.5 HERITAGE

From a regional and natural landscape perspective, the proposed development site forms part of a highly-transformed landscape altered through mining activities as well as high concentration of proposals for development of several renewable energy (solar) facilities. While the proposal would relate to a landscape modification, we **do not consider** that it would alter any natural or cultural landscape of cultural significance. (De Kock, 2016)

8.6 PALAEONTOLOGICAL

The proposed Humansrus Solar 3 PV Facility near Copperton, including the associated short 132 kV transmission line to the Kronos Substation and other infrastructure, is **unlikely to have significant impacts** on local palaeontological heritage resources. There is no preference on palaeontological heritage grounds for the preferred or alternative layout of the solar facility. Given the **generally low** palaeontological sensitivity of the Copperton region (based on several recent field studies in the area), the cumulative impact of the proposed solar facility as well as several other local alternative energy developments is assessed as **low**. (Almond, 2015)

8.7 ARCHAEOLOGICAL

The construction of a solar facility on the farm Humansrus will result in **direct, physical disturbance of any archaeological material** (and its context) on the property. The heritage and scientific potential of an archaeological site is **highly dependent on its geological and spatial context**. Large scale excavations will damage archaeological sites and construction of roads and laydown areas can contribute to high levels of impact. The impacts are likely to be most severe during the construction period although indirect impacts may occur during the operational phase of the project.

Indications are that in terms of archaeological heritage the proposed activity is viable; impacts are expected to be **limited and controllable**. Construction of the proposed solar facility may proceed. Either layout (Alternative 1 and Alternative 2) is acceptable.

Of concern, however, is the increasing number of renewable energy facilities in this area. The **cumulative impacts** of the developments will result in widespread destruction of pre-colonial sites. Although many of these sites have, individually, been rated as having low significance, the cumulative impact of the removal of all archaeological material will result in the destruction of large areas of archaeology and **could be considered significant**. (Webley, 2016).

8.8 VISUAL

It was found that the proposed alternatives would n**ot constitute a significant visual impact** to the characteristic landscape and further detailed visual assessment is not necessary for the following reasons:

- The proposed project's close proximity to the Copperton mine and TSF.
- The old railway line and borrow pits degrade the landscape in the immediate vicinity.
- The area is an unofficial node for Solar Energy development with adjacent sites already having authorization.
- The alignment of the proposed project with municipal planning. (VRM, 2015)

8.9 GEOTECHNICAL

The site conditions encountered on both these proposed development areas were classified as **suitable (with precautions)** for the development of the PV solar energy generating facilities. No

geotechnical factors were identified that resulted in either of the proposed development areas being unsuitable for the development of the planned facilities, each with a planned capacity of up to 75 MW. The precautions identified are related to shallow soil profiles, with hardpan calcrete occurring close to surface, requiring pre drilled rammed foundations rather than the conventional rammed foundations for founding the solar panel structures. (GCS, 2016).

8.10 TRAFFIC

It can be concluded that there are no evident problems to be expected while hauling freight along any of the transport routes to site. However, it is advised that routes must be adapted in situations of unforeseen events occurring. (AEP, 2016).

8.11 EMI / RFI

Based on the current SKA location information, a first order impact analysis shows a **possible interference scenario** between the Humansrus Solar 3 PV Facility and the SKA installations. In order to negate the risk to an acceptable level, all equipment to be installed on site must comply with levels of 40dB below the CISPR 11 Class A limit as the primary mitigation measure to accommodate cumulative effect of the high number of potential sources. Where equipment exceeds this threshold, additional shielding and filtering should be implemented to reduce the electromagnetic emissions from the PV facility. Shielding and filtering solutions are available to ensure the required 40dB below CISPR 11 Class A for equipment is reached. Should all equipment comply with the required 40dB below CISPR 11 Class A emissions, the total installed plant equipment emissions is expected to remain approximately 15dB below the CISPR 11 Class A limit. The compliance of the total facility to 15dB below the CISPR 11 Class A emissions is expected to result in emissions within SKA risk tolerances. (ITC, 2016).

8.12 SOCIO-ECONOMIC

From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings have been made:

- The preferred access road option from a social perspective is the preferred access road 2.

» The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of PV facilities (these relate to influx of non-local workforce and jobseekers, intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.

» Employment opportunities will be created in the construction and operation phase and the impact is rated as positive even if only a small number of individuals benefit in this regard.

» The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operation phases.

» Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.

» The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the increased awareness of climate change, represents a positive social benefit for society as a whole.

The proposed Humansrus Solar 3 PV Facility and associated infrastructure is unlikely to result in permanent damaging social impacts. The potential for positive socio-economic benefits can be realised, and this has been proven through the three projects which have already been constructed and are operational in the immediate area. There is also no opposition to the project from local landowners, councillors or community representatives. From a social perspective it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report (Savannah Environmental, 2016).

The issues and concerns identified through the baseline studies have been further investigated and assessed through detailed specialist impact assessments to follow in order to determine the significance of potential impacts possibly associated with the proposed project. The full assessments are included as stand-alone documents and summarised further in the main report.

9 PLANNING CONTEXT

A Town and Regional Planner will be appointed to facilitate the necessary Planning Application process for the proposed Humansrus Solar 3 PV Facility, which will include a land use change application for the rezoning of 220ha, from Agricultural Zone I to Special Zone, will be lodged at the Siyathemba Local Municipality, in accordance with the Northern Cape Planning and Development Act (Act 7 of 1998), to allow for the development of the proposed Humansrus Solar 3 PV Facility.

Parallel to the rezoning application, a long term lease application will be lodged at the National Department of Agriculture, in accordance with the Subdivision of Agricultural Land Act (Act 70 of 1970) to allow for the development of the proposed Humansrus Solar 3 PV Facility.

10 PROCESS TO DATE

This Environmental Impact Assessment Report (EIAR) follows the Scoping phase of the project which commenced with the Application Form being accepted by the Department of Environmental Affairs on **18 January 2016** (Ref: 14/12/16/3/3/2/888) authorising *Cape EAPrac* to commence with the scoping phase of the environmental process. This project and the environmental process was advertised in the Noordwester newspaper (issue of 20 November 2015), inviting the public to register as interested and affected parties. The Pre Application and formal Scoping Reports (Ref: SIY402/01 and SIY402/06) were made available to Stakeholders and Interested and Affected Parties (I&APs) for a review and comment period.

All comments received during this period were collated and included in the Final Scoping Report for submission to the national Department of Environmental Affairs (DEA).

DEA confirmed receipt of and accepted the FSR and Plan of Study on **4 April 2016** and instructed the EAP to commence with the Environmental Impact Assessment phase. This

Environmental Impact Assessment Report (EIAR) and accompanying Environmental Management Programme (EMPr), reflect the findings and recommendations of the specialist investigations, as well as comments received as part of the public participation process to date: The draft EIAR (SIY402/12) is being made available for a period of **30 days** for comment and review from **Monday 30 May to Wednesday 29 June 2016**.

This process has taken all the necessary steps to ensure compliance with the legislation and allowed ample opportunity for members of the public and key stakeholders to be involved and participate in the environmental process.

This report reflects the findings of specialist impact assessments and reports (Agricultural, Biophysical, Avifaunal, Freshwater, Heritage, Palaeontological, Archaeological, Visual, EMI/RFI, Geotechnical, Traffic and Socio-Economic), as well as providing details of the proposal in the Engineering and Layout Reports.

As part of the public participation process various key stakeholders have been identified and notified of the project and their right to participate and comment on the proposal. The project has been advertised and stakeholders that response to the adverts, notices and written notices will be kept informed throughout the remainder of the on-going environmental process. Please see Section 18 in the main report and **Appendix F** for evidence of the Public Participation process.

11 CONCLUSIONS & RECOMMENDATIONS

Renewable energy is considered favourable compared to conventional electricity generation methods, which include coal fired stations. International literature confirms the long-term benefits of the generation of electricity from renewable / alternative energy sources (e.g. solar / wind) to far exceed those associated with fossil fuel energy, and as such it should be supported. The associated impacts of the Humansrus Solar 3 PV Facility, have been assessed by various specialists (Agriculture, Ecology, Avifaunal, Aquatic, Heritage, Archaeology, Palaeontology, Visual, Traffic, Geotechnical, Socio-Economic and EMI/RFI Path Loss) and the overall impact ratings with mitigation range between **Low and Medium negative with some positive socio-economic impacts**.

Members of the public and other key stakeholders and authorities were requested to review this Environmental Impact Assessment Report (EIAR) in order to familiarise themselves with the project proposal and potential impacts that may be caused by the development. Concerns and issues raised during the scoping phase have been used to inform the more detailed impact assessment phase included in this report.

The EIAR is being made available for public review and comment for a period of **30 days** extending from **Monday 30 May to Wednesday 29 June 2016**. Queries and comments must submitted to *Cape EAPrac*, in writing, and within the specified comment period to be captured and collated for submission to the competent authority. Comments must be addressed to:

Cape *EAP*rac:
ATT: Ms Melissa Mackay
P.O. Box 2070, George, 6530
Tel: 044 874 0365
Fax: 044 874 0432
E-mail: mel@cape-eaprac.co.za

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 INTRODUCTION

Cape EAPrac has been appointed by **Humansrus Solar 3 (Pty) Ltd.**, hereafter referred to as the Applicant, as independent environmental practitioner, to facilitate the Scoping & Environmental Impact Reporting (S&EIR) process required in terms of the National Environmental Management Act (NEMA, Act 107 of 1998) for the proposed Humansrus Solar 3 PV Facility near Prieska, Northern Cape.

The Applicant has sub-leased a portion of Farm 147 Humansrus from the landowner, Mrs Christina Human, for the purposes of developing the proposed solar facility. The total generation capacity of this solar facility will not exceed **75MW** for input into the national Eskom grid.

The purpose of this **Environmental Impact Assessment Report** is to describe the environment to be affected, the proposed project, the process followed to date, to present the findings and recommendations presented in the specialist impact assessment studies, and provide a description of how the development concept has been adjusted to consider the above.

1.1 RENEWABLE ENERGY OVERVIEW AND THE NORTHERN CAPE PROVINCE

South Africa has for several years been experiencing considerable constraints in the availability and stability of electrical supply. Load shedding procedures have been applied since December 2005 due to multi-technical failures, as well as capacity and transmission constraints.

Eskom generates about 95% of South Africa's electricity supply, and has undertaken to increase capacity to meet growing demands. At the moment, the country's power stations are 90% coal-fired, and two huge new facilities are being built to add to this capacity. However, Eskom's plans to increase its national capacity by 40 000 megawatts in the period to 2025 have had to be scaled down due to the global economic recession (Northern Cape Business website).

International best-practice requires a 15% electricity reserve margin to deal with routine maintenance requirements and unexpected shutdowns in electricity supply systems. South Africa has historically enjoyed a large reserve margin (25% in 2002, 20% in 2004 and 16% in 2006), but that has declined over the recent past to 8% - 10%, as a result of robust economic growth and the associated demand for electricity. The spare power available to provide supply at any time of the day is known as the reserve capacity and the spare plant available when the highest demand of the year is recorded is known as the reserve margin (National Response to South Africa's Electricity Shortage, 2008). This has resulted in limited opportunities for maintenance and necessitated that power stations are run harder. This results in station equipment becoming highly stressed and an increase in unplanned outages and generator trips. The expected demand growth will rapidly erode this margin, as well as Eskom's ability to recover after it's already stressed systems shutdown.

The White Paper on Renewable Energy (2003) has set a target of 10 000GWh of energy to be produced from renewable energy sources (mainly from biomass, wind, solar and small-scale hydro) by 2013. The Minister determined that 3 725 megawatts (MW) to be generated from Renewable Energy sources is required to ensure the continued uninterrupted supply of electricity. This 3 725 MW is broadly in accordance with the capacity allocated to Renewable Energy generation in Integrated Resource Plan (IRP) 2010-2030.

This necessitates the additional generation of at least 3 000MW in the shortest possible time, to allow the reserve necessary to bring Eskom's system back into balance (*ibid*). This need can either be addressed from the *supply* or the *demand* side. Where the demand side interventions include short, medium and long term aspects of a national Power Conservation Programme to

incentivise the public to use less electricity (as mentioned above), one of the supply side options (besides Eskom building new plants and returning old plants to service) is to allow **Independent Power Producers** (IPPs) to contribute electricity to the national grid (National Response Document, 2008). **Humansrus Solar 3 (Pty) Ltd.** is one such body, which intends generating electricity from a renewable energy resource, namely solar.

In March 2011, the Cabinet approved the 2010 IRP, in terms of which energy from renewable sources will be expected to make up a substantial 42% of all new electricity generation in the country over the next 20 years. The government's New Growth Path for the economy also envisages up to 300 000 jobs being created in the "green" economy by 2020 (South Africa info website).

Minister Tina Joemat-Pettersson, the current Minister of Energy issued a media statement on 16 April 2015 on the Expansion and Acceleration of the Independent Power Producer Procurement Programme.

In this statement, she stated that resolving the energy challenge remains a critical element of the South African Cabinet¡¦s list of nine strategic priorities to be pursued in partnership with the private sector and all stakeholders.

In this press release, the Minister confirmed that she instructed the Department and the IPP Office to accelerate and expand the Renewable Energy IPP Procurement Programme through:

- Utilising the enabling provisions in the current RFP to allocate additional MWs from Bid Window 4 procurement process.
- Issuing a Request for Further Proposals for an expedited procurement process of 1800MW from all technologies.
- Redesign the current RFP for the Fifth Bid Submission phase to be ready for release in the second quarter of 2016.

The Department of Energy (DoE) has set a number of dates for the submission of bid documents for private companies to apply for a licence to generate electricity. The bidding deadlines for the first two stages were as follow:

- 1st Bid Submission: 4 November 2011.
- 2nd Bid Submission: 5 March 2012.
- 3rd Bid submission: 19th of August 2013.
- 4th Bid submission: 18 August 2014.
- 4th Expedited submission 11 November 2015.
- 5th Bid Submission: To be confirmed.

Every year the DoE collects data on renewable energy contributions from relevant stakeholders to assess or evaluate progress towards this goal. The following was presented by the DoE in a press release in August 2015 to illustrate the success of this program to date.

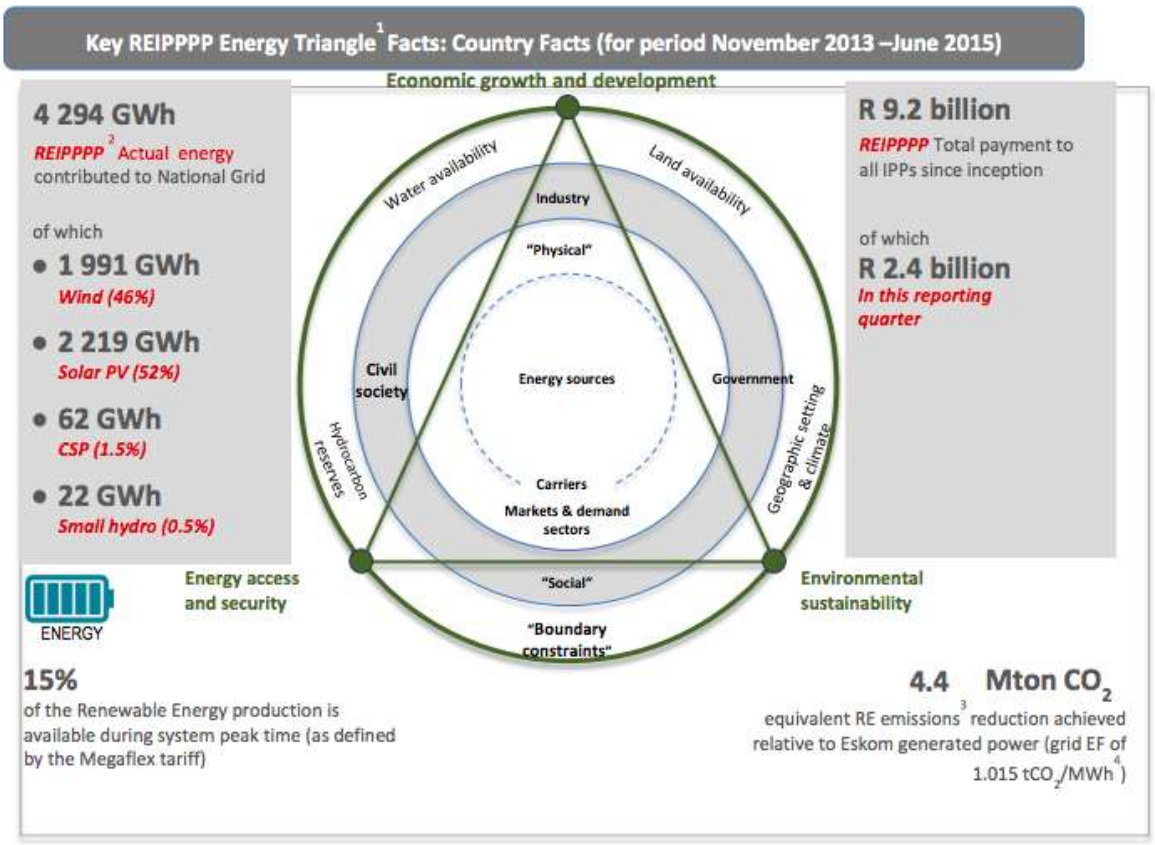


Figure 2: DoE REIPPPP Country Facts (2015)

From the completed four bid windows, a total number of 92 IPPs have secured contracts with Government to produce RE with a combined nameplate capacity of 6,327MW. At least 48 of these IPPs are located in the Northern Cape Province; 17 are in the Eastern Cape; and 11 in the Western Cape Province. Free State and North West provinces share five each, Limpopo Province has three and the rest of the provinces each has one IPP (DoE, 2015).

The Northern Cape is suggested by many to be the ideal location for various forms of alternative energy. This has resulted in a number of feasibility studies being conducted, not least of which an investigation by the Industrial Development Corporation in 2010 (R33-million spent) into potential for photo-voltaic, thermal, solar and wind power (Northern Cape Business website).

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

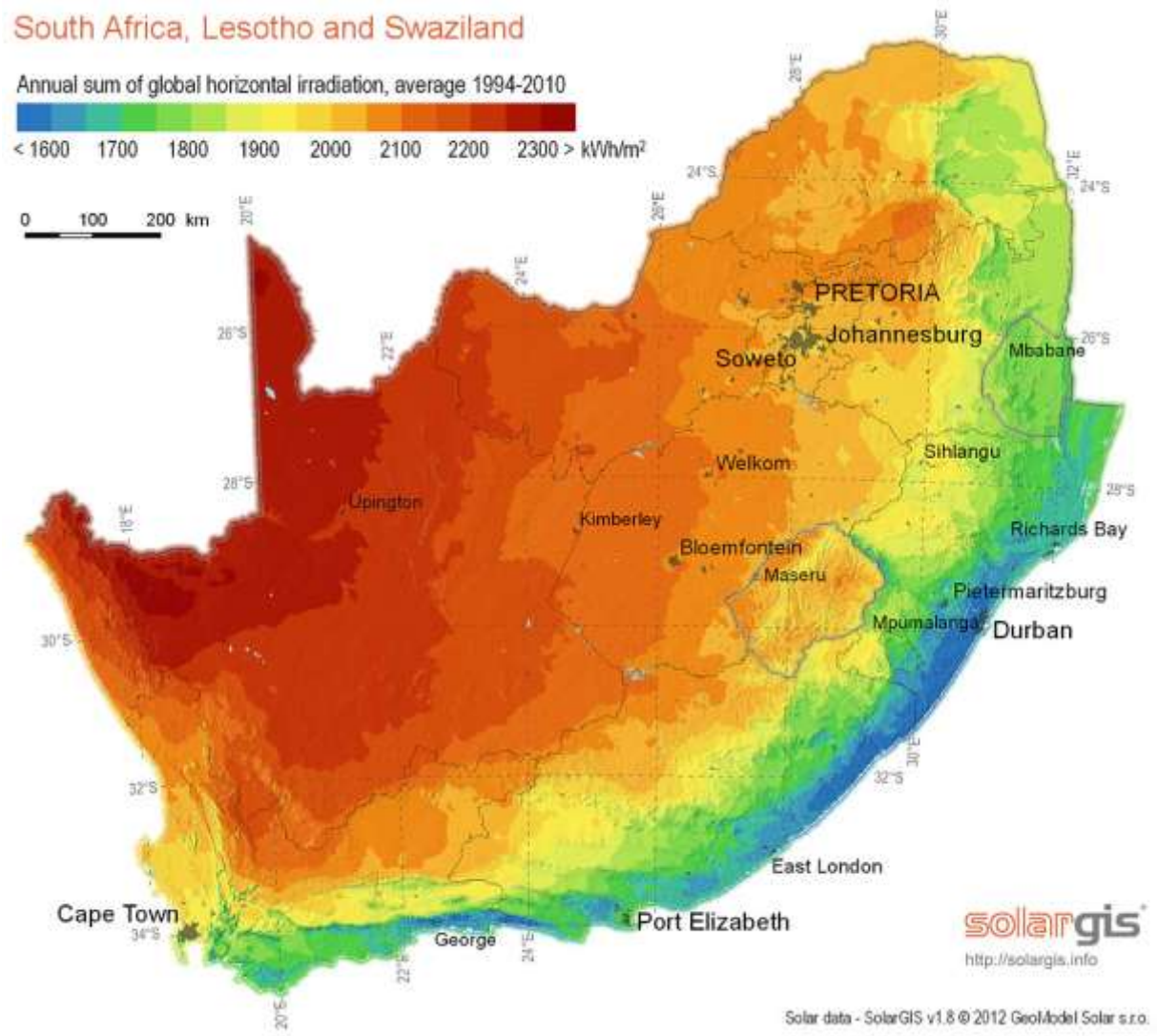


Figure 3: Solar radiation map for South Africa (Source: Solargis/info accessed on 15 August 2012).

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

A solar-investment conference was held in November 2010 at Upington and was attended by 400 delegates from all over the world. Dipuo Peters, the previous national Minister of Energy, outlined the competitive advantages of the Northern Cape, over and above its extremely high irradiation levels, amongst others:

- relative closeness to the national power grid compared to other areas with comparable sunshine;
- water from the Orange River;
- access to two airports; and
- good major roads and a flat landscape (Northern Cape Business website – solar power).

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

To take advantage of this potential for the Northern Cape to become a national renewable-energy hub, the groundwork is being done on a mega-project that has the capacity to fundamentally change the structure of South Africa's power sector: to build a massive solar park that will generate an eighth of the country's electricity needs – 5 000MW – in the Northern Cape near Upington. Sixteen square kilometres of land (thousands of hectares) have been identified and Eskom is looking for private partners. The park, which will cost more than R150-billion, will generate 1 000MW in its first phase. A full feasibility study will now be conducted with the support of the Central Energy Fund and the Development Bank of Southern Africa (Northern Cape Business website – solar power). Significant job creation, lucrative private-sector investments, local industry development and a cleaner, more secure power supply are among the benefits of a large-scale park such as this (BuaNews online).

Indeed this potential for solar energy generation plants has resulted in the emergence of smaller solar energy projects throughout the Northern Cape. The Northern Cape, offering the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete. (DoE, 2015).

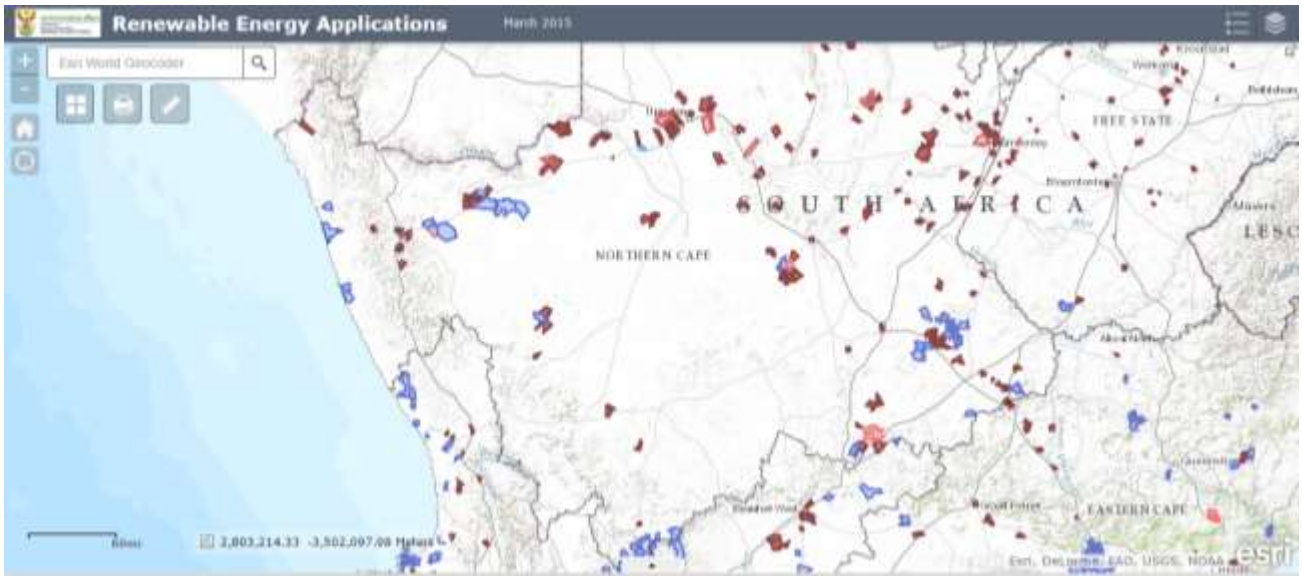


Figure 4: Renewable energy Applications in the Northern Cape (DEA, 2015)

Humansrus Solar 3 PV Facility. is one such smaller IPP solar project which intends to generate **75MW** of electricity from solar-energy for inclusion into the National grid. The Humansrus Solar 3 PV Facility development site is considered ideal, primarily due to:

- The flat topography of the proposed development site and it's the availability for use for an alternative energy generation facility;
- The grid connection potential based in proximity to existing transmission & substation infrastructure – existing Cuprum Substation to the west of the site and the existing Kronos Substation to the south of the site.
- The site is located outside the urban edge of Prieska and 10kms south of the town of Copperton, in close proximity to an existing major transport route – the Prieska VanWyksvlei road (R357);
- The site falls within a high solar radiation area which allows for the maximisation of solar energy received.
- The terrain is flat which allows for optimisation of the layout and minimum interference with respect to shadows between individual solar infrastructure.
- The northern orientation with no obstructions to the north optimises efficiency.

- The fact that the proposed activity falls within an area with low agricultural potential reduces the environmental cost.
- Ground conditions are considered suitable which reduces construction costs.

The area in the Copperton / Humansrus already includes several approved renewable energy facilities, as well as applications for future installations.

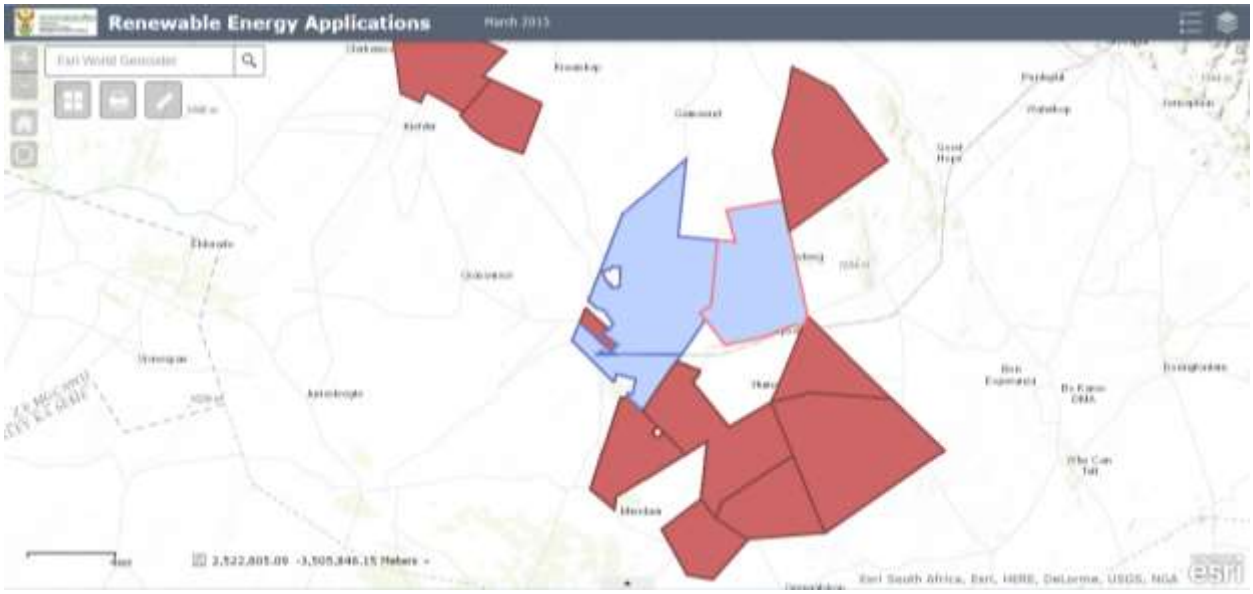


Figure 5: Renewable Energy Applications Copperton (DEA, 2015)

This suitability for potential renewable energy in the Northern Cape has led to strategic changes to the provincial planning programmes.

The Northern Cape Provincial Spatial Development Framework (2012) specifically recognises the potential for solar development in the province, identified with the introduction of a solar corridor stretching between ZF Mgcawu and the Pixley ka Seme regions and the solar-themed special economic zone (SEZ) in Khara Hais Municipality.

In 2014, the Renewable Energy Centre of Excellence (RECE) launched in the Northern Cape. It serves as a platform for innovation and skills development in the renewable energy sector and focuses on unlocking potential and attracting investment.

The province intends to become a net producer of RE to the rest of the country by 2020, inviting investment and development into the province.

According the DoE's State of Renewable Energy in South Africa, 2015, the biggest constraint to the development of renewable energy is grid capacity. The assessments have indicated a predominantly constrained transmission network, particularly in the Northern Cape, Eastern Cape and Western Cape provinces, where most of the successful REIPP projects are located. Consideration of the REIPPPP bid window 4 submissions suggested that the available grid capacity will be further reduced. A lack of grid reinforcement may curtail the procurement of the most cost effective generation due to the impact of increased transmission grid constraints.

2 LEGISLATIVE AND POLICY FRAMEWORK

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

2.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

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

2.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

The current assessment is being undertaken in terms of the **National Environmental Management Act** (NEMA, Act 107 of 1998)[2] . This Act makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the competent authority (in this case, the national Department of Environmental Affairs, DEA) based on the findings of an Environmental Assessment.

The proposed scheme entails a number of listed activities, which require a **Scoping & Environmental Impact Reporting (S&EIR) process**, which must be conducted by an independent environmental assessment practitioner (EAP). Figure 6 depicts a summary of the S&EIR process.

[2] On 18 June 2010 the Minister of Water and Environmental Affairs promulgated new regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA, Act 107 of 1998), viz, the Environmental Impact Assessment (EIA) Regulations 2014. These regulations came into effect on 08 December 2014 and replace the EIA regulations promulgated in 2010.

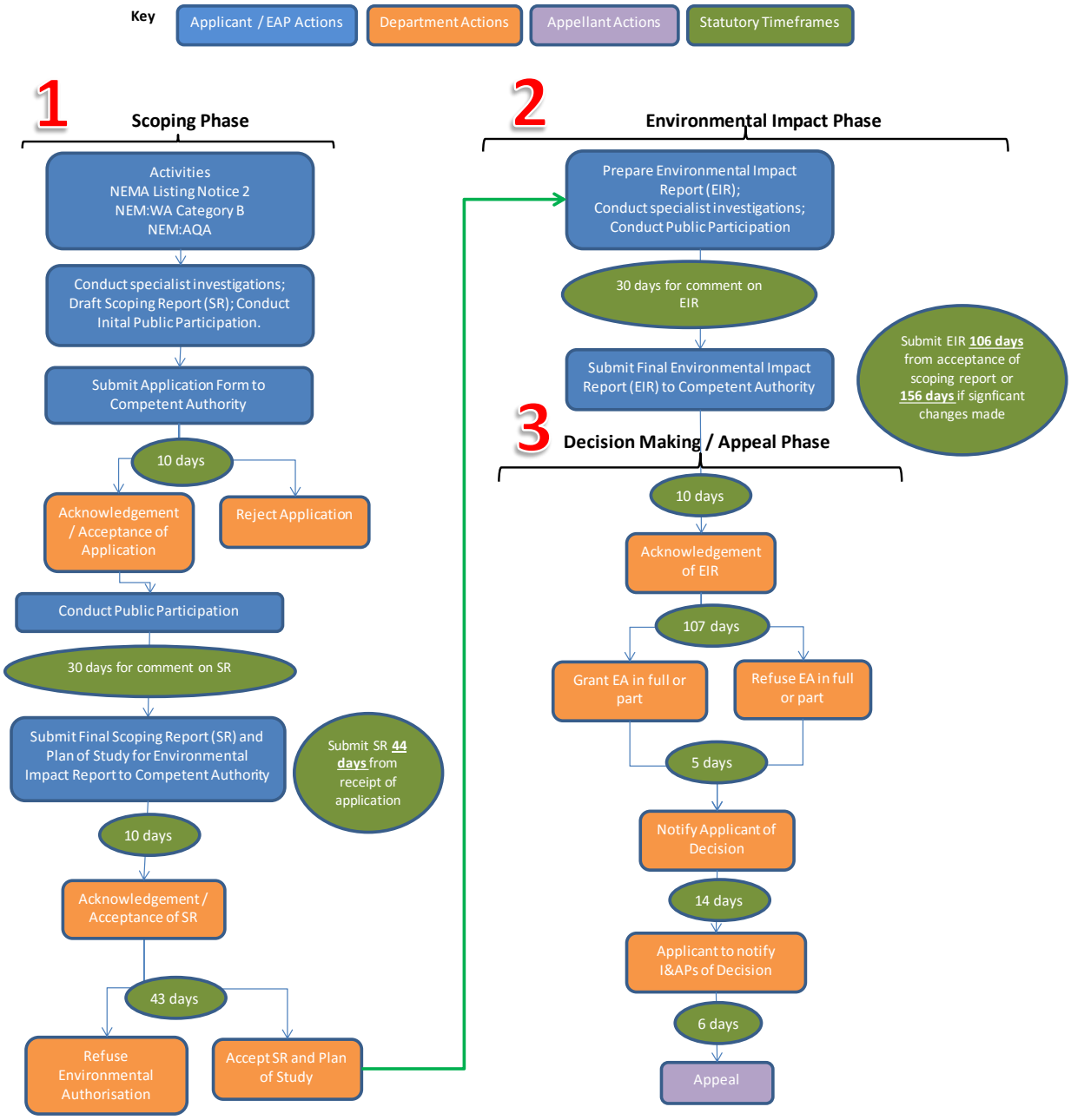


Figure 6: Summary of Scoping & EIR Process

2.3 LISTED ACTIVITIES & ASSOCIATED IMPACTS

The listed activities associated with the proposed development, as stipulated in the 2014 EIA Regulations 983, 984 & 985 are as follows:

Table 1: NEMA 2014 listed activities for the Humansrus Solar 3 PV Facility

R983	Listed Activity	Activity Description
11(i)	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts	The proposed Humansrus Solar 3 PV Facility will connect to the national electricity via the existing Eskom Kronos substation. The proposed distribution and transmission infrastructure included the construction of an on-site substation and a 132kV overhead power line from the on-site substation to the Kronos substation.

<table>
<tr><td colspan="3">The overheard powerline has the following associated Impacts as identified and assessed by the various specialists:
• Agriculture:
o Loss of agricultural land
o Loss of topsoil
o Generation of alternative income (positive)
• Ecological:
o Removal of vegetation
o Disturbance of fauna during construction
o Soil erosion during construction
o Alien plant invasion during operation
o Disturbance of fauna during operation
o Cumulative impact on broad-scale ecological processes & habitat fragmentation
• Avifaunal:
o Habitat loss for avifaunal species
o Disturbance and displacement of avifaunal species
o Mortality due to electrocution and collisions
• Aquatic:
o Physical removal of the narrow strips of woody riparian zones at crossings
o Increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils at crossings
o Increase in sedimentation and erosion within the development footprint
o Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment
• Visual:
o Visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity
• Archaeology:
o Unearthing of significant finds during construction
• Palaeontology:
o Unearthing of significant finds during construction</td></tr>
<tr><td>12(x)&(xi)</td><td>The development of (x) buildings exceeding 100m² in size, or (xi) infrastructure or structures with a physical footprint of 100m² 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 32m of a watercourse, measured from the edge of the watercourse.</td><td>The development of roads/tracks & PV arrays across the on-site drainage systems / washes. Stabilisation of stream / drainage line bed & banks may be required. The drainage lines have been avoided wherever possible, but it is not likely that internal roads networks will be able to do so.</td></tr>
<tr><td colspan="3">The overheard powerline, road crossings and solar PV facility has the following associated Impacts as identified and assessed by the various specialists:
• Ecological:
o Removal of vegetation
o Disturbance of fauna during construction
o Soil erosion during construction
o Alien plant invasion during operation
o Disturbance of fauna during operation
o Cumulative impact on broad-scale ecological processes & habitat fragmentation
• Avifaunal:
o Habitat loss for avifaunal species
o Disturbance and displacement of avifaunal species</td></tr>
</table>

	o Mortality due to electrocution and collisions • Aquatic: o Physical removal of the narrow strips of woody riparian zones at crossings o Increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils at crossings o Increase in sedimentation and erosion within the development footprint o Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment • Visual: o Visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity • Archaeology: o Unearthing of significant finds during construction • Palaeontology: o Unearthing of significant finds during construction	
19(i)	The **infilling or depositing of any material** of more than 5m³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5m³ from – (i) **a watercourse**; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100m inland of the high water mark of the sea or an estuary,, whichever distance is the greater**.**	The development of roads/tracks & PV arrays across the on-site drainage systems / washes. Stabilisation of stream / drainage line bed & banks may be required. The drainage lines have been avoided wherever possible, but it is not likely that internal roads networks will be able to do so.
The overheard powerline, road crossing and solar PV facility has the following associated Impacts as identified and assessed by the various specialists: • Ecological: o Removal of vegetation o Disturbance of fauna during construction o Soil erosion during construction o Alien plant invasion during operation o Disturbance of fauna during operation o Cumulative impact on broad-scale ecological processes & habitat fragmentation • Avifaunal: o Habitat loss for avifaunal species o Disturbance and displacement of avifaunal species o Mortality due to electrocution and collisions • Aquatic: o Physical removal of the narrow strips of woody riparian zones at crossings o Increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils at crossings o Increase in sedimentation and erosion within the development footprint o Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment • Visual: o Visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity • Archaeology: o Unearthing of significant finds during construction • Palaeontology:		

○ Unearthing of significant finds during construction		
R984	**Listed Activity**	**Activity Description**
1	The development of facilities or infrastructure for the **generation of electricity** from a renewable resource where the electricity output is **20MW or more,** excluding where such development or infrastructure is for photovoltaic installations and occurs within an urban area.	Humansrus Solar 3 PV Facility will have a maximum electricity generation capacity of **75MW**.

The solar PV facility has the following associated Impacts as identified and assessed by the various specialists:

- Agriculture:
  - Loss of agricultural land
  - Land disturbance, changing run-off characteristics and increasing erosion risks
  - Loss of topsoil
  - Placement of spoil material during construction
  - Generation of alternative income (positive)
- Ecological:
  - Removal of vegetation and listed or protected plant species during construction
  - Disturbance of fauna during construction
  - Soil erosion during construction
  - Alien plant invasion during operation
  - Disturbance of fauna during operation
  - Soil erosion during operation
  - Cumulative impact on broad-scale ecological processes & habitat fragmentation
- Avifaunal:
  - Habitat loss for avifaunal species
  - Disturbance and displacement of avifaunal species
  - Disorientation from solar panels
  - Mortality due to electrocution and collisions
- Aquatic:
  - Physical removal of the narrow strips of woody riparian zones at crossings
  - Increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils at crossings
  - Increase in sedimentation and erosion within the development footprint
  - Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment
- Heritage:
  - Change in land use character
- Visual:
  - Visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity
  - Dust impacts during construction
  - Light pollution at night
- Archaeology:
  - Unearthing of significant finds during construction
- Palaeontology:
  - Unearthing of significant finds during construction
- Traffic:
  - Increased heavy traffic on the R357
- EMI/RFI Path Loss
  - Interference with SKA
- Socio-economic
  - Creation of employment during construction (positive)

	○ Economic multiplier effects from the use of local goods and services (positive) ○ Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of people ○ Temporary increase in traffic disruptions and movement patterns during the construction phase ○ Temporary increase in safety and security concerns associated with the influx of people during the construction phase ○ Point of access off the R357 and nuisance impacts in terms of temporary increase in dust and the wear and tear on the R357 ○ Employment opportunities and skills development opportunities during the operation (positive) ○ Development of clean, renewable energy infrastructure (positive) ○ Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities ○ Visual impacts and sense of place impacts associated with the operation ○ Impacts associated with loss of farmland available for livestock grazing due to occupation of land by the solar energy facility ○ Cumulative increase in employment opportunities, skills development, SED and business opportunities with the establishment of more than one solar energy facility ○ Change to the local economy with an in-migration of labourers and jobseekers to the area. ○ Cumulative increase in traffic disruptions and increase in noise and dust with other solar energy facility developments ○ Visual impacts and change in the sense of place impacts associated with the establishment of more than one solar energy facility in the area ○ Decommissioning - Social impacts associated with retrenchment including loss of jobs and source of income	
15	The clearance of an **area of 20ha** or more of indigenous vegetation, excluding where such clearance of vegetation is required for – (i) The undertaking of a linear activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan.	Development of the Humansrus Solar 3 PV Facility of approximately **220ha** on vacant land, outside of any urban edge.
The overheard powerline, road crossings and solar PV facility has the following associated Impacts as identified and assessed by the various specialists: • Agriculture: ○ Loss of agricultural land ○ Land disturbance, changing run-off characteristics and increasing erosion risks ○ Loss of topsoil ○ Placement of spoil material during construction ○ Generation of alternative income (positive) • Ecological: ○ Removal of vegetation and listed or protected plant species during construction ○ Disturbance of fauna during construction ○ Soil erosion during construction ○ Alien plant invasion during operation ○ Disturbance of fauna during operation ○ Soil erosion during operation ○ Cumulative impact on broad-scale ecological processes & habitat fragmentation • Avifaunal: ○ Habitat loss for avifaunal species ○ Disturbance and displacement of avifaunal species		

- Disorientation from solar panels
- Mortality due to electrocution and collisions

- Aquatic:
  - Physical removal of the narrow strips of woody riparian zones at crossings
  - Increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils at crossings
  - Increase in sedimentation and erosion within the development footprint
  - Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment
- Heritage:
  - Change in land use character
- Visual:
  - Visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity
  - Dust impacts during construction
  - Light pollution at night
- Archaeology:
  - Unearthing of significant finds during construction
- Palaeontology:
  - Unearthing of significant finds during construction
- Traffic:
  - Increased heavy traffic on the R357
- EMI/RFI Path Loss
  - Interference with SKA
- Socio-economic
  - Creation of employment during construction (positive)
  - Economic multiplier effects from the use of local goods and services (positive)
  - Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of people
  - Temporary increase in traffic disruptions and movement patterns during the construction phase
  - Temporary increase in safety and security concerns associated with the influx of people during the construction phase
  - Point of access off the R357 and nuisance impacts in terms of temporary increase in dust and the wear and tear on the R357
  - Employment opportunities and skills development opportunities during the operation (positive)
  - Development of clean, renewable energy infrastructure (positive)
  - Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities
  - Visual impacts and sense of place impacts associated with the operation
  - Impacts associated with loss of farmland available for livestock grazing due to occupation of land by the solar energy facility
  - Cumulative increase in employment opportunities, skills development, SED and business opportunities with the establishment of more than one solar energy facility
  - Change to the local economy with an in-migration of labourers and jobseekers to the area.
  - Cumulative increase in traffic disruptions and increase in noise and dust with other solar energy facility developments
  - Visual impacts and change in the sense of place impacts associated with the establishment of more than one solar energy facility in the area
  - Decommissioning - Social impacts associated with retrenchment including loss of jobs and source of income

R985	Listed Activity	Activity Description
18(a)(ii) &	The widening of a road by more than 4 metres or the lengthening of a road by	Widening of existing **access and internal roads wider than 4 metres** for solar

(iii)	more than 1km. (a) In the Northern Cape. (iii) Outside urban areas; (iii) Areas on the watercourse side of the development setback line or within 100m from the edge of a watercourse where no such setback line has been determined.	facility, outside of any urban edge. Access roads are expected to have a width of approximately 6m but not exceeding 8m.

The access road and road crossings have the following associated Impacts as identified and assessed by the various specialists:

- Agriculture:
  - Loss of agricultural land
  - Land disturbance, changing run-off characteristics and increasing erosion risks
  - Loss of topsoil
  - Placement of spoil material during construction
- Ecological:
  - Removal of vegetation and listed or protected plant species during construction
  - Disturbance of fauna during construction
  - Soil erosion during construction
  - Alien plant invasion during operation
  - Disturbance of fauna during operation
  - Soil erosion during operation
  - Cumulative impact on broad-scale ecological processes & habitat fragmentation
- Avifaunal:
  - Habitat loss for avifaunal species
  - Disturbance and displacement of avifaunal species
  - Disorientation from solar panels
  - Mortality due to electrocution and collisions
- Aquatic:
  - Physical removal of the narrow strips of woody riparian zones at crossings
  - Increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils at crossings
  - Increase in sedimentation and erosion within the development footprint
  - Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment
- Visual:
  - Dust impacts during construction
- Archaeology:
  - Unearthing of significant finds during construction
- Palaeontology:
  - Unearthing of significant finds during construction
- Traffic:
  - Increased heavy traffic on the R357
  - Traffic congestion / delays
- Socio-economic
  - Creation of employment during construction (positive)
  - Economic multiplier effects from the use of local goods and services (positive)
  - Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of people
  - Temporary increase in traffic disruptions and movement patterns during the construction phase
  - Temporary increase in safety and security concerns associated with the influx of people during the construction phase
  - Point of access off the R357 and nuisance impacts in terms of temporary increase in dust and the wear and tear on the R357

- Employment opportunities and skills development opportunities during the operation (positive)
- Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities
- Cumulative increase in employment opportunities, skills development, SED and business opportunities with the establishment of more than one solar energy facility
- Change to the local economy with an in-migration of labourers and jobseekers to the area.
- Cumulative increase in traffic disruptions and increase in noise and dust with other solar energy facility developments
- Visual impacts and change in the sense of place impacts associated with the establishment of more than one solar energy facility in the area
- Decommissioning - Social impacts associated with retrenchment including loss of jobs and source of income

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

2.4 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY (ACT 10 OF 2004)

This Act controls the management and conservation of South African biodiversity within the framework of NEMA. Amongst others, it deals with the protection of species and ecosystems that warrant national protection, as well as the sustainable use of indigenous biological resources. Sections 52 & 53 of this Act specifically make provision for the protection of critically endangered, endangered, vulnerable and protected ecosystems that have undergone, or have a risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention through threatening processes.

Unfortunately, **no broad- or fine-scale spatial biodiversity planning for the Northern Cape exists**. This is major limitation as without a systematic conservation plan for the region, evaluating the significance of the development site within the broader context and broad-scale impacts, are difficult.

In terms of the National Spatial Biodiversity Assessment (NSBA), the Terrestrial Ecosystem Status of the entire development area is classified as **Least Threatened** (see **Appendix B** for biodiversity maps).

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

Considering that South Africa's protected area network currently falls far short of sustaining biodiversity and ecological processes, the NPAES aims to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to Climate Change. Protected areas, recognised by the National Environmental Management: Protected Areas Act (Act 57 of 2003), are considered formal protected areas in the NPAES. The NPAES sets targets for expansion of these protected areas, provides maps of the most important protected area expansion, and makes recommendations on mechanisms for protected area expansion. The NPAES has set a 20-year protected area target for each vegetation type in each biome, adding up to the overall land-based 20-year protected area target of 12% of South Africa's total land area.

The NPAES identifies 42 focus areas for land-based protected area expansion in South Africa. These are large intact and unfragmented areas suitable for the creation or expansion of large protected areas. Focus Area Number **14: Gariep**, falls within the Nama-Karroo biome and is

located approximately 10km east of the proposed solar site (see Location & Topographical Maps in **Appendix A** and NPAES map in **Appendix B**).

The NPAES does not deal with the site-scale planning on exactly which sites should be included in the protected area network, nor with detailed implementation planning for expanding protected areas. This responsibility lies with protected area agencies, such as provincial conservation authorities, South African National Parks (SANParks) and World Heritage Site Authorities.

The South African Heritage Resource Agency (SAHRA) and the Northern Cape Heritage Resource Agency are registered as key stakeholders for this environmental process and have been provided with the opportunity to provide comment on this solar energy development is relation to the NPAES for the Prieska area. South African National Parks (SANParks) head office confirmed that they had no interest in this area. **No issues** in this regard have been raised to date.

2.4.2 Municipal Biodiversity Summary Project (SANBI BGIS)

According to the information provided by the South African National Biodiversity Institute (SANBI) through their Biodiversity GIS (BGIS) system, the environment in Siyathemba Local Municipality is mostly untransformed (97.3% natural areas remaining), none of which is formally protected within land-based protected areas. Two biomes occur within the municipality, the Nama-Karoo (+/- 91.24%) and the Savanna (8.76%), which support ten (11) vegetation types, none of which are classified as critically endangered One vegetation type, the Lower Gariep Alluvial Vegetation is classified as Endangered. The proposed solar development site falls across the Bushmanland Arid Grassland and Bushmanland Basin Shrubland vegetation types, which both have ecosystem status of Least Threatened. The municipality falls within the Lower Orange Water Management Areas. Only two rivers traverse the Siyathemba Municipality, namely the Brak and the Orange Rivers, none of which traverse the proposed Humansrus Solar 3 PV Facility site. Approximately 530 wetlands have been identified to occur within the Municipality, none of which have Ramsar Wetland status, and none are located in proximity to the proposed solar site.

2.5 NATIONAL FORESTS ACT (NO. 84 OF 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".*

According to Todd (2016), there are a variety of nationally or provincially protected species present in the area which have been observed during previous site visits to the area. Perhaps the most common is the nationally protected tree species *Boscia albitrunca* which is particularly common in the rocky hills but occurs scattered on the plains as well. *Harpagophytum procumbens* is associated with red sands in the area and may be present at the site. This species is protected at the national and provincial level on account of its' popularity as a medicinal plant. It is however not rare and the population is estimated at several million plants. Other protected species observed during previous studies in the area include *Hoodia gordonii*, *Hoodia flava*, *Lithops halli*, *Titanopsis calcarea*, *Pachypodium succulentum*, *Mestoklema tuberosum*, *Aloe claviflora*, *Avonia ustulata* and *Boscia foetida*. Many of these species are associated with certain habitats such as quartz or calcrete patches and are not likely to occur at the site and were not observed on the previous site visits to the study area.

Please refer to the Ecological Impact Assessment Report in **Annexure E1** for a detailed description of the plant species found to occur in the area.

2.6 CONSERVATION OF AGRICULTURAL RESOURCES ACT – CARA (ACT 43 OF 1983):

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

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

In terms of soil and water resources, any drainage lines that may occur on the solar development site will be highlighted as sensitive. Caution would need to be exercised if any development were to take place within these areas, as although these drainages are currently well vegetated, and the removal of the vegetation would potentially result in the erosion of the drainage lines and mobilization of the dunes, which would be undesirable, ecologically, as well as for the development and surround land uses.

2.7 NORTHERN CAPE NATURE CONSERVATION ACT, NO. 9 OF 2009:

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

Manipulation of boundary fences: *19. No Person may –*

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

The perimeter fencing of the Humansrus Solar 3 PV Facility site will be constructed in a manner which allows for the passage of small and medium sized mammals: i.e. steel palisade fencing (20 cm gaps min), alternatively the lowest strand or bottom of the fence will be elevated to 15 cm above the ground at least at strategic places to allow for fauna to pass under the fence. The most appropriate method will be confirmed during the final design phase in collaboration with the biodiversity specialist. No electrified strands will be placed within 20 cm of the ground – to allow free movement of tortoises and reptiles in particular. During operation, all gates will be kept closed to ensure that no larger fauna enter and become trapped within the fenced-off area.

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), Protected (Schedule 2) to Common (Schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2 (common), except for listed species which are under Schedule 1. A permit is required for any activities which involve species listed under schedule 1 or 2.

According to the SIBIS database, only two red data-listed plant species are known from the area, *Hoodia gordonii* which is listed as DDD (data deficient, insufficient information) and *Salsola apiciflora* which is listed DDT (Data Deficient – Taxonomically Problematic). A permit would therefore be required in terms of these regulations in order to remove or translocate these plants. As the species is not rare and is abundant in the area, the development would not have a significant impact on the viability of the local population of this species.

The site lies within the range of approximately 43 terrestrial mammals, including four listed species. The listed species are the Black-footed cat *Felis nigripes* (VU) Brown Hyaena *Hyaena brunnea* (NT), South African Hedgehog *Atelerix frontalis* (NT) and Honey Badger *Mellivora capensis* (SA RDB EN). In terms of fauna, a permit will not be necessary for this project as no listed mammal, reptile or amphibian species are to be negatively impacted by the proposed solar development as the development would not result in significant habitat loss for these species considering that this less than the home range of a single individual of any one of these species..

According to the SABAP 2 database 129 species have been recorded from area. Based on a combined list from SABAP 1 and SABAP2, this includes eight listed species. The majority of the listed species are raptors which have been recorded infrequently from the area, suggesting that they are not common residents. The only species which is regularly recorded in the area is Ludwig's Bustard which accounts for as much as 10% of all collisions in South Africa. It is clear that the major impact of the development on birds would potentially be from the power line which could cause mortalities through electrocution and collisions. The possibility of an on-site connection to the existing line would however reduce impacts on avifauna to a very low level. In addition, if this is not possible, then the options which run adjacent to existing similar voltage lines would be considered most preferable.

2.8 NATURE & ENVIRONMENTAL CONSERVATION ORDINANCE (19 OF 1974)

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

2.9 NATIONAL HERITAGE RESOURCES ACT

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

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

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

- *the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- *any development or other activity which will change the character of a site exceeding 5 000 m² in extent;*
- *the re-zoning of a site exceeding 10 000m^2 in extent.*

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);

- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships).

The on-going environmental process will be informed by inputs from heritage, archaeological and palaeontological specialists. Sites that are considered to be sensitive will be identified and mapped with appropriate buffers. The layout for the Solar Facility itself has been informed by these constraints and **avoids select features**.

The Integrated Heritage Impact Assessment (including the above studies) has been submitted to SAHRA for further input, comment and decision-making. The Final Comment / Decision from SAHRA will be included in the EIAR once it is received.

2.10 NATIONAL WATER ACT, NO 36 OF 1998

Section 21 of the National Water Act (NWA) requires that authorisation be applied for from the Department of Water Affairs (DWA) for any water use / activity in, or on the banks, of any watercourse. Water use activities listed in Section 21 are as follows:

(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 majority of the Humansrus Solar 3 PV Facility and its associated infrastructure are to be constructed well away from any river / major drainage line / wetland. However, certain infrastructure such as internal roads will cross ephemeral washes for which a WULA has been submitted. An Aquatic study (Annexure E4) was undertaken for the property to inform that process. Confirmation of the submission of the WULA is included as Annexure H2.

This Act controls / regulates the utilization of natural water resources and provides provisions to safe-guard the integrity of these water resources.

The proposed Humansrus Solar 3 PV Facility is likely to require approximately 10 000m³ of water during the +/- 18 month construction period, as well as approximately 3 000m³ per annum for the +/- 25 year operational lifespan of the solar energy facility.

Water required for the construction and operation of the Humansrus Solar 3 PV Facility is to be sourced from various sources. Currently the Alkantpan Test Range and the municipality have confirmed that it has capacity to provide purified water from the Prieska Water Treatment Works to Alkantpan for the facility. See Annexure H3.

In terms of the National Freshwater Ecosystem Priority Area (NFEPA) mapping no rivers or wetlands occur on the solar development property.

DWA have been registered as key stakeholders and requested to provide input in this regard.

2.11 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, including the Siyathemba Municipality, has been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), Meerkat and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that has to be protected.

A high level risk assessment has been conducted at the **South African SKA Project Office** to determine the potential impact of the neighbouring Humansrus Solar 1 and 2 PV Facilities on the Square Kilometre Array. This assessment confirmed that the nearest SKA station has been identified as **SKA station ID 1899**, at approximately 17km from the proposed installation. Therefore, based on the distance to the nearest SKA station, this facility poses a **very high risk of detrimental impact on the SKA**. As a result of the very high risk associated with those PV facilities, the SKA project office recommended that **further EMI and RFI detailed studies** be conducted as significant mitigation measures would be required to lower the risk of detrimental impact to an acceptable level. Due to its location in the same vicinity, Humansrus Solar 3 PV Facility also requires this assessment.

An EMI/RFI Path Loss report has been commissioned to assess the risk and propose mitigations. This report is included as Annexure E12 of this EIAR. SKA has been approached to provide their input and comment on this document.

2.12 SUSTAINABILITY IMPERATIVE

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

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

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

"conceptual bridge" between the right to social and economic development, and the need to protect the environment.

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

In terms of NEMA sustainable development requires the integration of the relevant factors, the purpose of which is *to ensure that development serves present and future generations.*[3]

It is believed that the proposed 75MW Humansrus Solar 3 PV Facility supports the notion of sustainable development by presenting a reasonable and feasible alternative to the existing vacant land use type, which has limited agricultural potential due the poor soil properties, extreme climatic conditions and low grazing capacity. Furthermore the proposed alternative energy project (reliant on a natural renewable resource – solar energy) is in line with the national and global goal of reducing reliance on fossil fuels, thereby providing long-term benefits to future generations in a sustainable manner.

The area has also developed as a hub of renewable energy facilities, effectively excluding all surrounding land from agriculture.

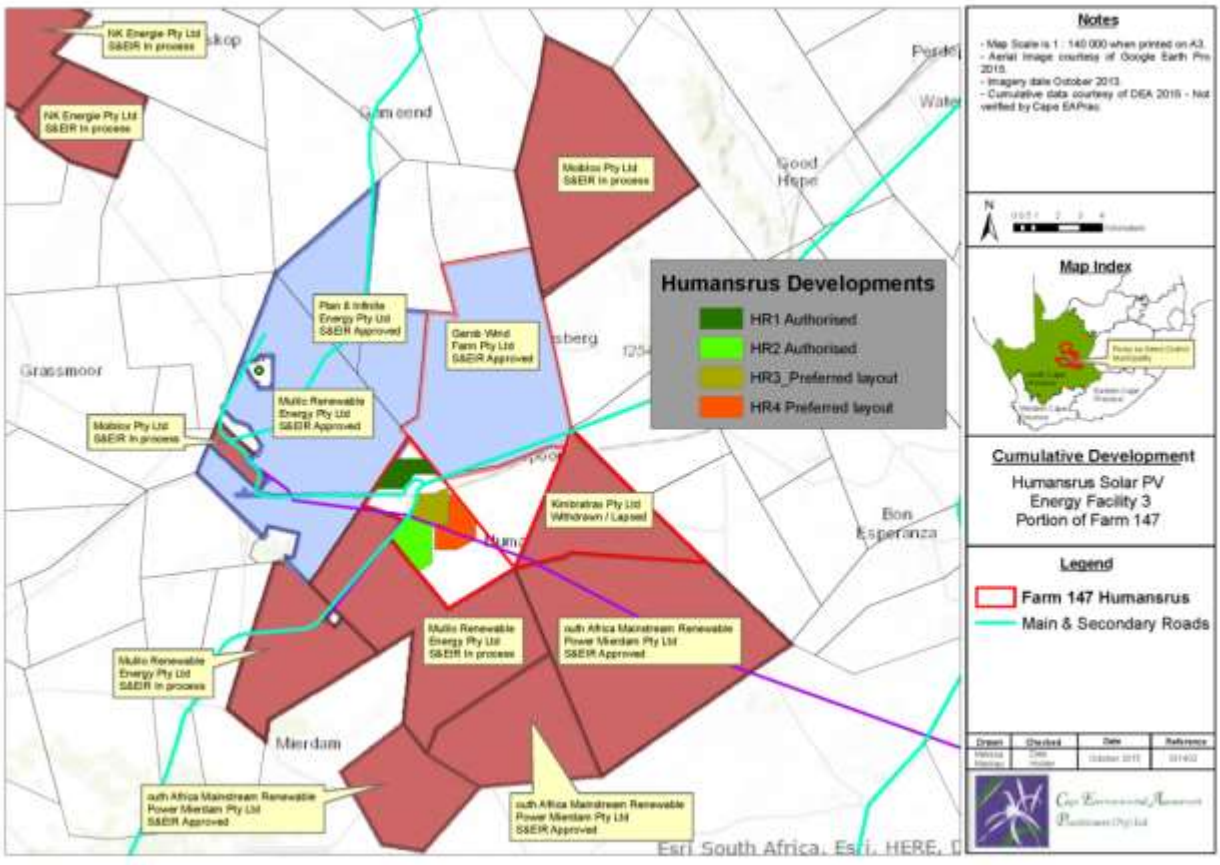


Figure 7: Cumulative developments (DEA, 2015)

3 See definition of "sustainable development" in section 1 of NEMA.

2.13 NATIONAL CLIMATE CHANGE RESPONSE WHITE PAPER (2011)

Climate change is already a measurable reality and along with other developing countries, South Africa is especially vulnerable to its impacts. The White Paper presents the South African Government's vision for an effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society.

South Africa's response to climate change has two objectives:

- Effectively manage the inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity; and
- Make a fair contribution to the global efforts to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enabled economic, social and environmental development to proceed in a sustainable manner.

The paper proposes a number of approaches dealing with climate change impacts with respect to selected sectors. Energy, and specifically renewable energy, is considered to be one of the key sectors that provides for possible mitigations to address climate changes.

2.14 EIA GUIDELINE FOR RENEWABLE ENERGY PROJECTS

The Minister of Environmental Affairs published the Environmental Impact Assessment Guideline for Renewable Energy in terms of section 24J of the National Environmental Management Act, 1998 (Act No. 107 of 1998) on 16 October 2015.

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

Sustainable energy can be defined as energy which provides affordable, accessible and reliable energy services that meet economic, social and environmental needs within the overall developmental context of society, while recognising equitable distribution in meeting those needs. Sustainable energy is an element of sustainable development which is defined as development that meets the present needs and goals of the population without compromising the ability of future generations to meet theirs. On the overall sustainable development is underpinned by economic development (growth efficiency), social development (culture, heritage, poverty, and empowerment) and environmental development (pollution and natural resources).

The government of South Africa considers the use of renewable energy as a contribution to sustainable development. Most renewable energy sources are indigenous and naturally available, and the use of renewables therefore strengthens energy security because it is not subject to disruption by international crisis. Fuel wood, charcoal, coal and kerosene (paraffin) in the rural and peri-urban South Africa is the primary source of energy for cooking and heating. Sustainable development implies replacing firewood and charcoal with more modern energy sources, while at the same time introducing technological innovations to improve the efficiency and environmental problems associated with coal and kerosene. Sustainable development also implies the provision of electricity and other modern fuels to the commercial and industrial sectors to promote their economic competitiveness and future prosperity.

In order to facilitate the development of first phase IPPs procurement programme in South Africa, these guidelines have been written to assist project planning, financing, permitting, and

implementation for both developers and regulators. The guideline is principally intended for use by the following stakeholder groups:

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

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

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

Table 2: Potential environmental impacts of solar energy projects (Adapted from DEA, 2015)

Impact Description	Relevant Legislation
Visual Impact	NEMA
Noise Impact (CSP)	NEMA
Land Use Transformation (fuel growth and production)	NEMA, NEMPAA, NHRA
Impacts on Cultural Heritage	NEMA, NHRA
Impacts on Biodiversity	NEMA, NEMBA, NEMPAA, NFA
Impacts on Water Resources	NEMA, NEMICMA, NWA, WSA
Hazardous Waste Generation (CSP and PV)	NEMA, NEMWA, HAS
Electromagnetic Interference	NEMA
Aircraft Interference	NEMA, MSA
Loss of Agricultural Land	SALA
Sterilisation of mineral resources	MPRDA

Assuming an IPP project triggers the need for Basic Assessment (BA) or scoping environmental Impact Assessment (S&EIA) under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMP.

Potential mitigation measures for solar energy projects include but are not limited to:

- Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats;

- Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;
- Utilise existing roads and servitudes as much as possible to minimise project footprint;
- Site projects to avoid construction too near pristine natural areas and communities;
- Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;
- Fence sites as appropriate to ensure safe restricted access;
- Ensure dust abatement measures are in place during and post construction;
- Develop and implement a storm water management plan;
- Develop and implement waste management plan; and
- Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.

The proposed Humansrus Solar 3 PV Facility has included all mitigations and recommendations specific to the items above in order to ensure that impacts are kept to a minimum.

2.15 THE NATIONAL ENERGY ACT (34 OF 2008)

One of the objectives of the National Energy Act is to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements; to provide for increased generation and consumption of renewable energies (Preamble)."

The Act provides the legal framework which supports the development of various energy resources, taking into consideration environmental and social requirements. From this aspect, the Act aligns itself with the NEMA in terms of sustainable social development.

2.16 DEPARTMENT OF ENERGY STRATEGIC PLAN 2015-2020

The Department of Energy (DoE) is mandated to ensure secure and sustainable provision of energy for socio-economic development. This is achieved by developing an Integrated Resource Plan (IRP) for the entire energy sector and promoting investment in accordance with the IRP which focuses on energy. The DoE envisions the pursuance of the aforementioned mandate through the following strategic statements:

» *Aim*: Formulate energy policies, regulatory frameworks and legislation, and oversee their implementation to ensure energy security, promotion of environmentally-friendly energy carriers and access to affordable and reliable energy for all South Africans.

» *Vision*: Improving our energy mix by having 30% clean energy by 2025. The vision of the DoE will be realised by the following factors as depicted in Figure 5 below.

» *Mission*: To regulate and transform the energy sector for the provision of secure, sustainable and affordable energy.

The DoE Strategic Plan 2015-2020 Programme 6 on Clean Energy focusses on managing and facilitating the development and implementation of clean and renewable energy initiatives as well

as Energy Efficiency Demand-Side Management (EEDSM). Sub-programmes within Programme 6 include: energy efficiency, renewable energy, climate change and designated national authority.

2.17 WHITE PAPER ON THE ENERGY POLICY OF THE REPUBLIC OF SOUTH AFRICA (1998)

The White Paper on Energy Policy states the need to improve the energy security in the country by means of expanding the energy supply options. This implies the increase in the use of renewable energy and encouraging new entries into the generation market. The support for the renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account. Government policy on renewable energy is thus concerned with meeting the following challenges:

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

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

2.18 WHITE PAPER ON THE RENEWABLE ENERGY POLICY OF THE REPUBLIC OF SOUTH AFRICA (2003)

The White Paper on Renewable Energy Policy supplements the Government's overarching policy on energy as set out in its White Paper on the Energy Policy of the republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy recognises the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies.

The White Paper on Renewable Energy sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources in particular. However South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, but which have so far remained largely untapped. This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that include: ensuring that equitable resources are invested in renewable technologies; directing public resources for implementation of renewable energy technologies; introducing suitable fiscal incentives for renewable energy and; creating an investment climate for the development of renewable energy sector. The White Paper on Renewable Energy of 2003 set a target of 10 000GWh to be generated from renewable energy by 2013. The target was reviewed during the renewable energy summit of 2009 held in Pretoria. The summit raised the issue over the slow implementation of renewable energy projects and the risks to the South African economy of committing national investments in the energy infrastructure to coal technologies. Other matters that were raised include potential large scale roll out of solar water heaters and enlistment of Independent Power Producers to contribute to the diversification of the energy mix.

2.19 STRATEGIC INFRASTRUCTURE PROJECTS (SIPS)

The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services, and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development, and enabling regional integration.

The proposed PV facility is a potential SIP 8 Project (Green Energy in support of the South African economy) and SIP 9 (Electricity Generation to support socio-economic development) project if selected as a preferred bidder project by the Department of Energy.

2.20 NORTHERN CAPE PROVINCIAL DEVELOPMENT AND RESOURCE MANAGEMENT PLAN / PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (PSDF) (2012)

The PSDF, together with the Provincial Growth and Development Strategy (PGDS), is set to fulfil an important role as a spatial and strategic guideline that addresses the key challenges of poverty, inequality and environmental degradation through the innovative use of the resources (capital) of the province for the benefit of all concerned. The Northern Cape PSDF is premised upon and gives effect to the following five strategic objectives of the National Strategy for Sustainable Development (NSSD 2011-2014):

- Enhancing systems for integrated planning and implementation
- Sustaining our ecosystems and using natural resources efficiently
- Towards green economy
- Building sustainable communities
- Responding effectively to climate change

The PSDF makes reference to the need to ensure the availability of energy. Under the economic development profile of the Northern Cape PSDF, the White Paper on Renewable Energy Policy (2003) discussed a target of 10 000GWh of energy to be produced from renewable energy sources. It was also stated that the total area of high radiation in South Africa amounts to approximately 194 000km^2, of which the majority falls within the Northern Cape. It is estimated that, if the electricity production per km^2 of mirror surface in solar thermal power stations were 30.2MW and only 1% of the area of high radiation were available for solar generation, then generation potential would equate to approximately 64GW. A mere 1.25% of the area of high radiation could thus meet projected South African electricity demand in 2025 (80GW). It was also stated in the Northern Cape PSDF that the implementation of large solar power plants has been proposed as one of the main contributors to reducing greenhouse gas emission in South Africa. One of the policies in the Northern Cape PSDF is for renewable energy sources (e.g. Wind, solar, biomass, and domestic hydro-electricity generation) to comprise 25% of the province's energy capacity by 2020; thereby the proposed development will assist in contributing to the Province's renewable energy capacity.

The PSDF provides for the generation of development regions and corridors. These constitute a clustering of nodes and the creation of a system that synergises the capacity of stakeholders and entities within these nodes to ensure institutional and leadership capacity that would lead to regional equity. The development corridors of the Northern Cape are demonstrated in Figure 8 below, with the Solar Corridor situated in the Northern Cape represented in yellow. This corridor centres around Upington and extends from roughly Kakamas in the north to De Aar in the east.

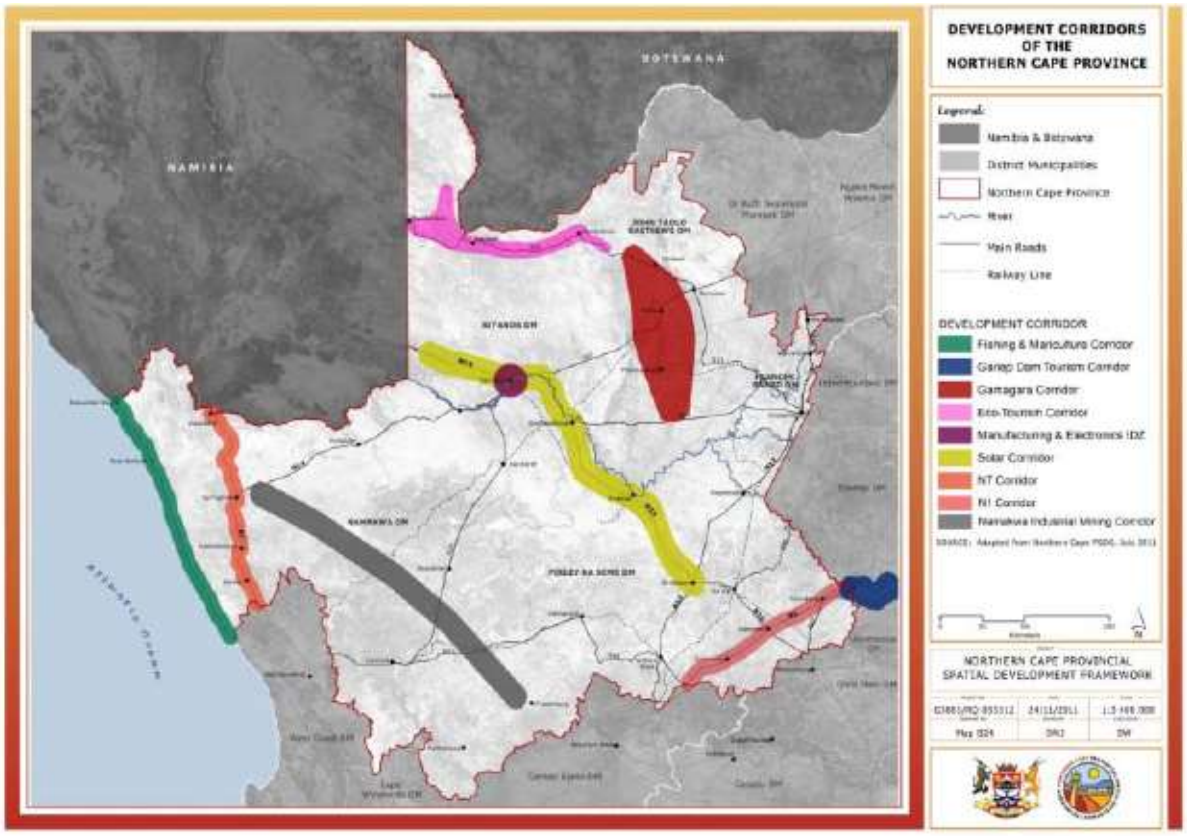


Figure 8: Northern Cape Development Corridors (NCPSDF, 2012)

The recommendations of these policies and guidelines have been used to guide the Scoping Report, Environmental Impact Report and the Environmental Management Programme.

3 ACTIVITY

The Applicant, Humansrus Solar 3 (Pty) Ltd., intends to develop a **75MW solar energy facility** on a portion of the Farm 147 Humansrus near Prieska in the Northern Cape.

The proposed **photovoltaic (PV) solar facility** will have a **net generation capacity of 75 MWp AC** (86.25 MWp DC installed) and the **development footprint will be approximately 220ha** in size. The PV technology will be either fixed-tilt PV, single-tracking/axis PV or double-tracking/axis PV. The infrastructure associated with this PV development will include the following:

- **Solar field** of PV modules/panel arrays with **maximum structure height of +/- 10 metres**;
- Maximum of **86 x inverter stations / mini-substations** (including MV distribution transformers) at a height of 3m;
- **On-site Switching Station / Substation** of approx. 2000 m^2 in size (including a switching station, IPP transformer, IPP HV yard, ESKOM HV yard, switch gear and feeder bays);
- **Overhead 132kV transmission power line** to distribute the generated electricity from the on-site substation to the existing Eskom Kronos Distribution Substation (south east of the site). Transmission line will be a single circuit line, approx. **6km in length**, with a **maximum height of 25m**, within a **servitude width of 31m – 40m**;
- **Auxiliary buildings with a footprint of approximately 1000-1300m^2**, including:
  - Control Centre (+/- 250m^2);
  - Office (+/- 250m^2);
  - Warehouses (x2) (+/- 100m^2)
  - Canteen & Visitors Centre (+/- 300m^2)
  - Staff Lockers & Ablution (250m^2); and
  - Gate house / security offices (+/- 50m^2),

- Parking area (+/- 300m^2)
- **Internal electrical reticulation network** (underground cabling);
- **Access road** and **internal road / track network**;
- **Laydown areas**, required for material & equipment (+/- 5ha [50 000m^2]);
- **Rainwater tanks** (+/- twenty 10kl tanks)**;** and
- **Perimeter fencing** & lighting around the solar facility.

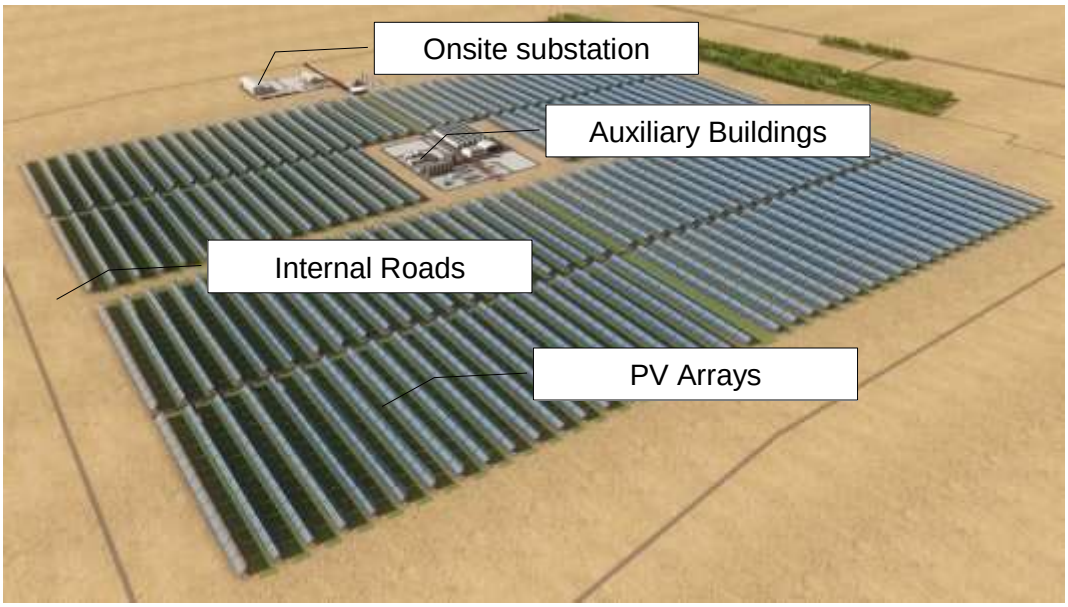
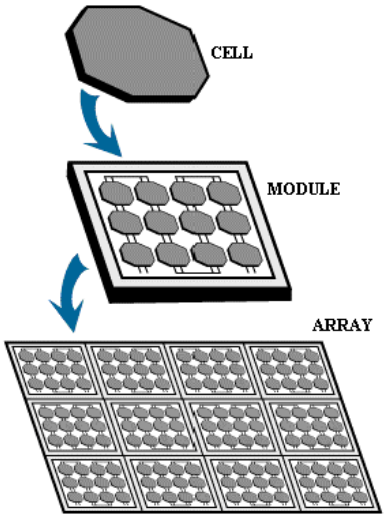


Figure 9: Typical layout of the components of a Solar PV facility (Solek, 2016)

3.1 TECHNOLOGICAL OVERVIEW

Photovoltaic (PV) solar power technology has been identified as the preferred technology to generate electricity in this project. This includes both conventional PV as well as Concentrated Photovoltaic (CPV) technologies.



A solar *'array / rack'* consists of a number of *'panels / modules'* that in turn are made up of hundreds of small individual *'cells'*. Individual arrays / racks are then grouped into various rows that make up most of what one sees as a solar plant / field. Arrays are mounted on aluminium frames that are rammed into the soil to keep them in an upright and stable position.

Figure 10: Diagrammatic representation of typical PV panel array (Solek, 2016)

Photovoltaic (PV) panels convert the energy delivered by the sun into direct current (DC) electric energy. The PV arrays are connected to inverters by means of a network of underground cables, which in turn invert the direct current (DC) to alternating current (AC). The power generated is then stepped-up to the required voltage and frequency of the national grid, by using a transformer. The generated electricity is then distributed from the on-site transformer/s via an overhead transmission/distribution power line to the nearest Eskom Substation (Kronos). From the Eskom substation, the electricity is fed into the national Eskom grid.

Several alternate options in terms of the photovoltaic solar technology will be considered. These alternatives will include layout, technological and operational. The following section provides an overview of the technological options to be considered.

3.1.1 Fixed & Tracking Options

Fixed-tilt / stationary solar technology comprises the PV modules being fixed to the ground in a specific north facing angle and consist of no moving parts.

Single axis tracking systems are mounted in a north facing position and move east-west to follow the path of the sun across the sky every day, allowing the modules to be exposed to typically 25% more radiation than fixed PV systems. Single-axis tracking systems contain only a few moving parts and have more or less the same footprint and infrastructure requirements than that of fixed-tilt designs.

Figure 11: Examples of single / horizontal axis PV tracking systems (Solek, 2016)

Double axis tracking systems are very effective as they track the sun in more than one axis. This allows for maximum radiation over the entire solar module.

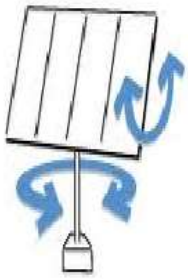


Figure 12: Examples of double axis PV tracking systems (Solek, 2016)

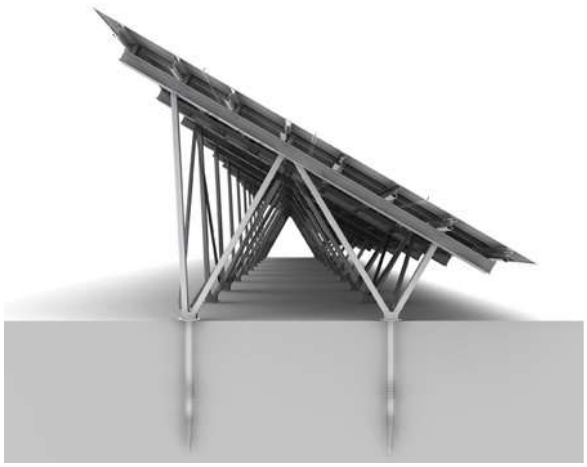
3.1.2 Founding / Mounting Options

The most common foundation used for anchoring PV solar frames is concrete cast foundations. This type of foundation requires a foundation trench, shuttered aboveground, filled with concrete and reinforcing steel. Once the concrete has cured, the solar frame is then welded or bolted to protruding reinforcing steel (or could have been left to cure within the concrete).


Figure 13: Examples single axis & fixed solar cast foundations (Solek, 2016)

This technology is much more suitable to European conditions and not for the extremely hard surfaces of the proposed site, unless the concrete is cast onto the surface using shutters. Another alternative considered for the mounting of the solar frames is pre-cast concrete footing. The pre-cast concrete feet could be manufactured off site, reducing the risk of concrete spillages and the need for exorbitant amounts of water during the construction phase of the project. Drawbacks associated with pre-cast footing include the large physical footprint required to keep the structures stable, in addition to the possible need for them to be bolted or grouted to the ground surface for stability.

Considering the above, is has been recommended that the Humansrus Solar 3 PV Facility be installed by means of **driven/rammed piers, earth-screws or rock anchors**, as these will have a similarly reduced impact on the environment. This option is further supported by the findings of the Geotechnical report. The figures below show the equipment required for the ramming process.



This installation technology eliminates the need for the use of cement or polymeric products, and as a result of the very small mounting footprint, has minimal disturbance of the ground cover, substrate or natural water flow (which could have significant long term effects on the ecology of the surrounding area).

Figure 14: Typical rammed or screwed method with fixed frame (Solek, 2016)

3.1.3 Film Options

There are a multitude of different Photovoltaic (PV) film technologies available today. These include thin-film (amorphous silicon or cadmium telluride) or multi-crystalline cells, selected depending on the space and irradiance conditions, with the electricity yield and application being the deciding factors.

With ambient temperatures regularly exceeding 40 °C in the area, thin-film technology may not suited to the conditions of the Northern Cape Province, due to its inferior performance at high temperatures. **Multi-crystalline or thick-film technology** is thus the preferred film technology as they easily outperform the thin-film alternative. There are no environmental impacts associated with the different film options, therefore all film options will be considered.

3.2 SOLAR LAYOUT ALTERNATIVES

The ecological specialist reports significantly influenced the layouts within the impact assessment phase. Different alterations in terms of the ecology sensitive areas were made. Please refer to the site development plan in Annexure D2 for a graphic representation of the mitigations that influenced both alternatives.

Ecology specialist studies

The feedback received from the ecology specialist (Simon Todd Consulting, Simon Todd) was that there were minor sensitive areas to take cognisance of in terms of the design. According to the ecology report the borrow pits located on the property have a higher sensitivity than the rest of the development footprint. A **100 meter buffer area** around both the borrow pits on the farm were proposed in the ecology report. This proposed buffer area does not affect the preferred site (Alternative1), but does reduce the useable area of the alternative site (Alternative 2). No further mitigation measures are required from an ecological perspective.

Avifaunal specialist studies

The feedback received from the avifaunal specialist (Simon Todd Consulting) was that there were minor sensitive areas to take cognisance of in terms of the design and overlaps with the ecology findings. According to the avifaunal report the **borrow pits** located on the property have a **higher sensitivity** than the rest of the development footprint. A **100 meter buffer area** around both the borrow pits on the farm were proposed in the ecology report. This proposed buffer area does not affect the preferred site, but does reduce the useable area of the alternative site. The following diagram depicts the location of these borrow pits in relation to the alternative and preferred sites

The avifaunal study found that the "*development is likely to have little, if any significant long-term impact on the avifauna of the wider area, especially after mitigation, and as such, is considered to have acceptable levels of impact overall.*" (Avifaunal report, December 2015).

The mitigation measures to be included influenced the preferred layout by suggesting "*slight alterations to the alternative site layout, so that the development is an acceptable distance away from the borrow pit to avoid impacting sensitive species associated with this microhabitat*" (Avifaunal report, March 2016).

The mentioned sensitivity areas were excluded from the design (although most of these have an exact correlation with the ecology sensitivity map) and as was excluded from the footprint in this capacity (100 meter buffer area from the identified borrow pits).

Aquatic specialist studies

Two ephemeral washes and sensitive areas have been identified and were assessed by the aquatic specialist. Ideally these two ephemeral washes should be spared from the development and a 32 meter buffer area should be allowed for in order to mitigate any "Water Use Licence" (WUL) requirements. It is however stipulated in the aquatic study conclusion that the possible impacts could be mitigated with suitable storm water management due to the fact that the annual run-off is very low.

Figure 15 below depicts the two delineated alluvial washes and the corresponding 32m WULA buffer area should the need for a "Water-use licence" be mitigated.

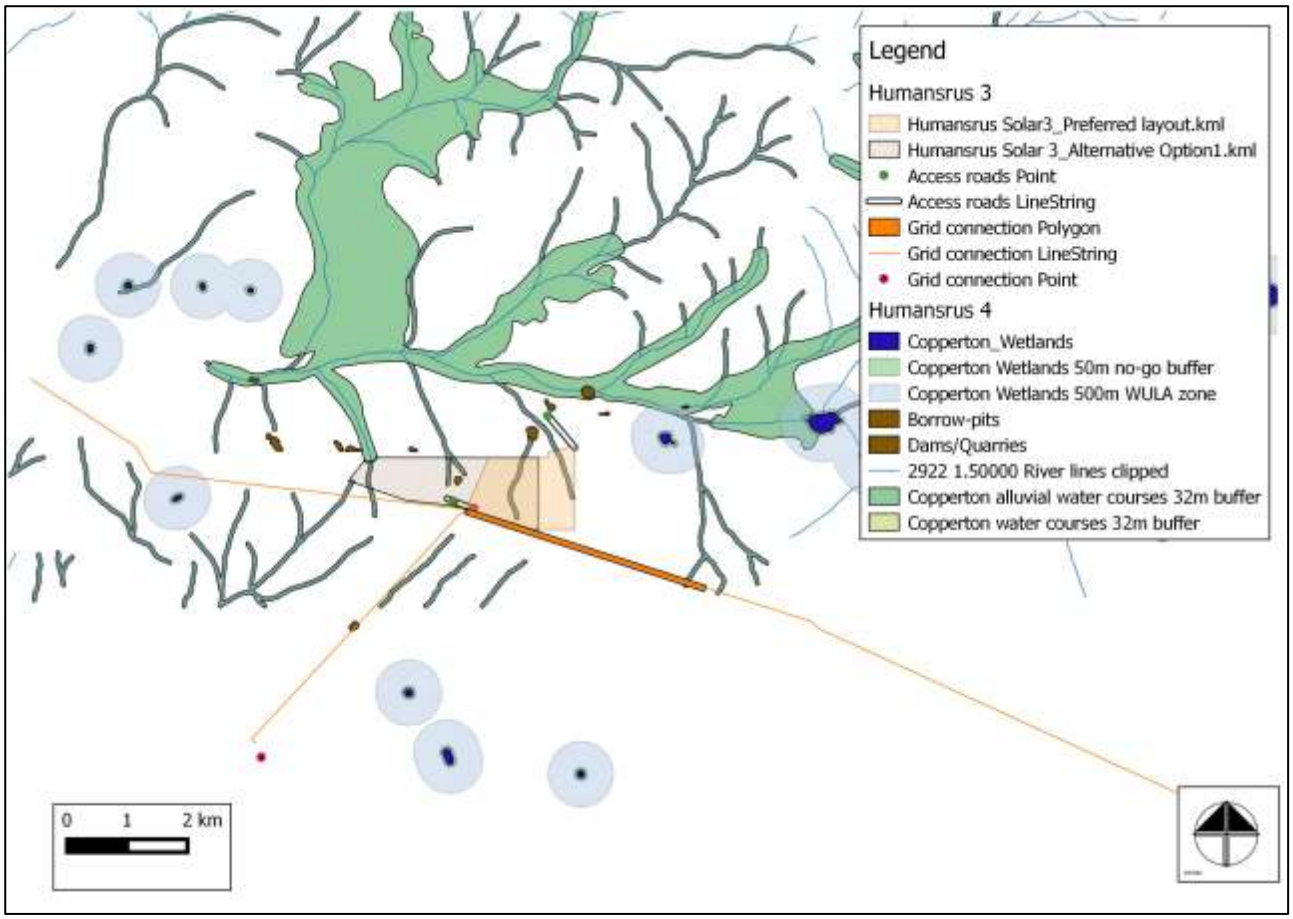


Figure 15: Aquatic delineated alluvial washes and 32m WULA zone

It can be concluded therefore that the necessity of a water use licence can be eliminated should the 32 meter buffer around the alluvial washes be spared of development. Should these buffer areas however be affected by the development such a licence will be required. A WULA has been submitted to the DWS but no further action will be taken by them unless this proposal is accepted as a preferred bidder post EIA.

In the Preliminary Study site it is proposed to build across ephemeral washes in order to keep the solar design as rectangular as possible. The solar frames can be installed using a ramming method which would have the minimum impact on the environment. As far as practically possible the ramming poles would be driven as far as possible from all drainage lines and sensitive areas to take the ecological constraints into account. Additionally the Storm water Management Plan incorporates mitigation measures for these two ephemeral alluvial washes.

Visual specialist studies

The feedback received from the appointed visual specialist consultant, "Visual Resource Management Africa" (VRMA, Stephen Stead), includes a 75m no-go buffer area from the R357 and Copperton road. The visual study used activity heights of 10 meters for PV panel structures and 25 meters for Power line structures. This is assumed to be worst-case heights and have a large possibility of being lower than these assumed values.

3.2.1 Alternative 1 – Preferred Layout

Alternative 1 proposes a footprint of no more than 220ha within the 852ha study site. This Alternative was initially developed taking into consideration the ecological constraints identified for Humansrus Solar 1 and Humansrus Solar 2 projects. It has been further refined taking into account the items identified above by the specialists.

It must be noted that the preferred road access **Alternative 2 (Preferred road access)** (section 3.3.4 (ii) below) is considered part of this Preferred Layout.

This preferred layout has considered the following:

- Area of approximately 220 ha , to ensure the project would be economically viable , allowing for exclusions of environmental sensitive areas;
- Minimal disturbance to water washes and highly sensitive areas;
- Road access to the site with regard to distance and minimal disturbance to sensitive areas as per Road Access Alternative 2 (Preferred);
- Grid connection to Kronos taking into consideration minimal distance and minimal disturbance to sensitive areas.
- The co-ordinates of the development footprint are:
    - NW corner: 22˚22’45”E / 29˚58’27”S
    - NE corner: 22˚23’38”E / 29˚58’20”S
    - SW corner: 22˚22’31”E / 29˚58’59”S
    - SE corner: 22˚23’38”E / 29˚59’12”S
- The co-ordinates of the grid connection are:
    - Grid start: 22˚22’36”E / 29˚58’58”S
    - Grid middle: 22˚21’28”E / 30˚00’06”S
    - Grid end: 22˚20’20”E / 30˚01’25”S

Alternative 1 has considered preliminary site constraints, incorporating site specific constraints / significant environmental sensitive areas identified by the various specialists. It must be noted that the constraints identified below retain the footprint area determined in the scoping phase and are applicable to the internal layout of the facility

These adjustments will aim to achieve the least possible environmental impact, while maintaining the economic viability of the project. The potential impacts (negative and positive) associated with this layout, as well as any further alternatives, have been assessed as part of this Environmental Impact Reporting phase (EIR) of the on-going environmental process. Recommendations / measures focused on the construction, operation and decommissioning phases of the development, have also been included in the Environmental Management Programme (EMPr).

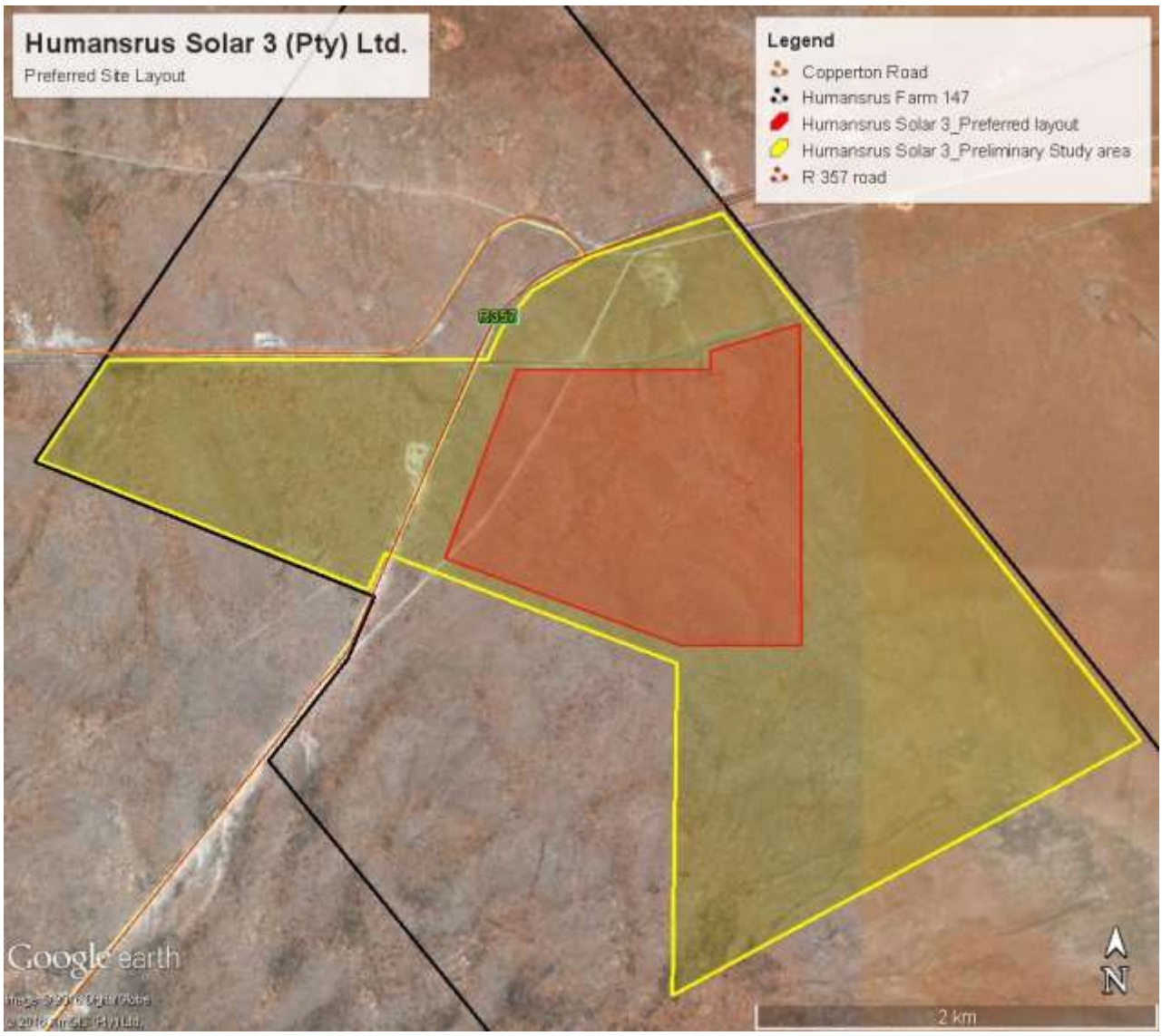


Figure 16: Preferred Alternative 1 development footprint (Solek, 2016)

The components and infrastructure of the facility includes the ground-mounted structures, solar modules, cables, inverter rooms, access roads, auxiliary roads, auxiliary buildings (administration, security, workshop, storage and ablution), rainwater tanks, perimeter fencing with associated security infrastructure, an on-site substation, and electrical distribution line.

The exact position of these components will be determined with the final plant design after preferred bidder status is obtained. The final facility infrastructure of the preferred layout will have a footprint of approximately 200-220 ha. The layout is aimed at having the lowest possible environmental impact while keeping the project economical viable.

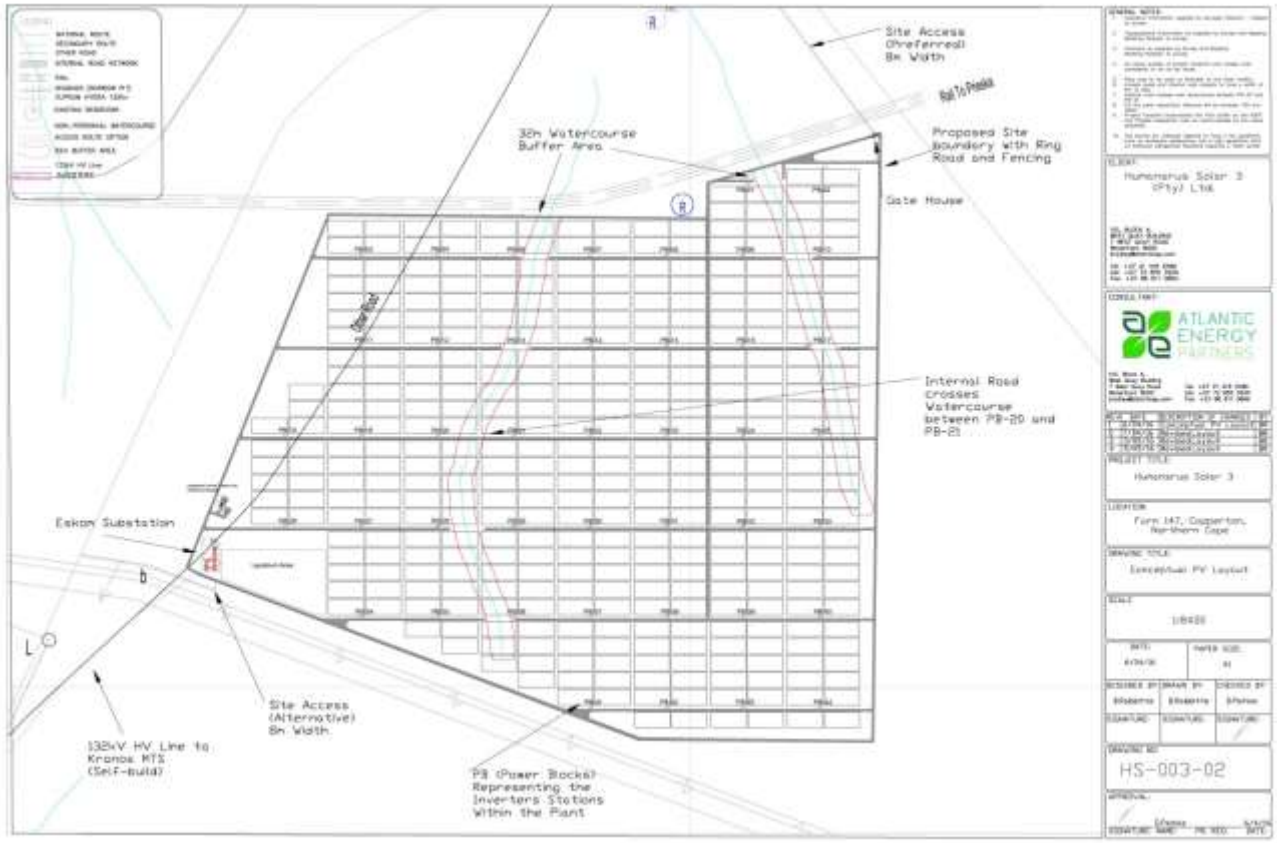


Figure 17: Preferred Alternative 1 Layout (AEP, 2016)

3.2.2 Alternative 2

Alternative 2 is an area of approximately 220ha in size and concentrated in the western portion of the abovementioned 852ha study site. This layout has the same aspects as Alternative 1:

- Area of approximately 220 ha , to ensure the project would be economically viable , allowing for exclusions of environmental sensitive areas;
- Minimal disturbance to water washes and highly sensitive areas;
- Road access to the site with regard to distance and minimal disturbance to sensitive areas;
- Grid connection to Kronos taking into consideration minimal distance and minimal disturbance to sensitive areas.

Alternative 2 has considered preliminary site constraints, similar to those of Alternative 1, incorporating the site specific constraints / significant environmental sensitive areas identified by the various specialists.

The potential impacts (negative and positive) associated with this layout, as well as any further alternatives, have been assessed as part of this Environmental Impact Reporting phase (EIR) of the on-going environmental process.

The choice of Alternative 1 over this alternative is related to the grouping of the panels in one area thus providing continuity and avoiding areas of disturbance in the areas identified as sensitive. This alternative has been rated similarly by the various specialists but it is fragmented and thus Alternative 1 is preferred.

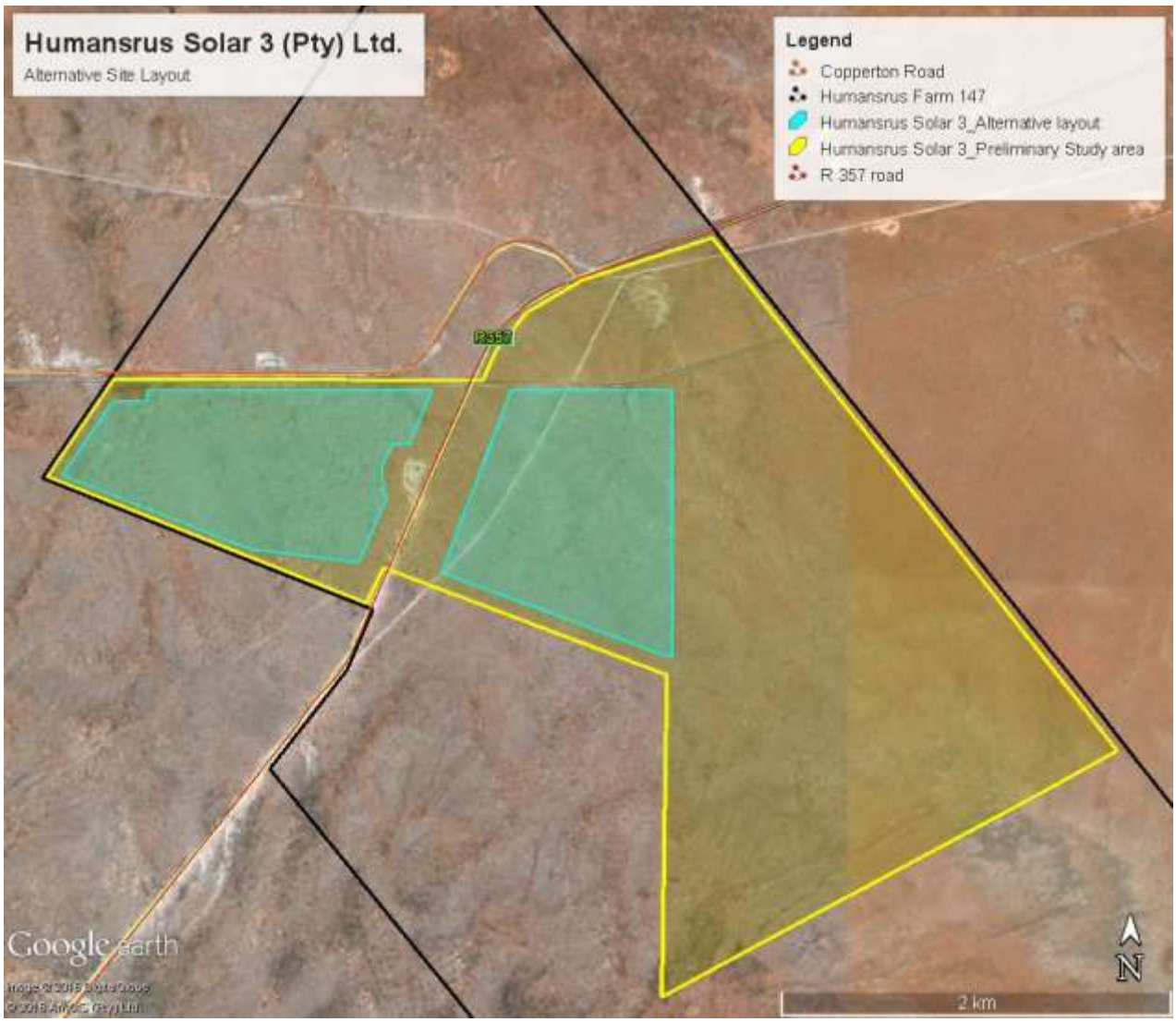


Figure 18: Alternative 2 (Solek, 2015)

Note specifically the exclusion of the 100m buffer area for ecology on the borrow pit.

3.2.3 NO-GO ALTERNATIVE

The **Status Quo Alternative** proposes that the Humansrus Solar 3 PV Facility not go ahead and that only the two approved projects (Humansrus Solar 1 and Humansrus Solar 2) go ahead.

The remaining land on which the proposed project is proposed is currently vacant and does not form part of the approved project areas. It is currently used for limited grazing activities, however due to a combination of poor soil quality, water scarcity and extreme climatic conditions, it has no potential for irrigated crop cultivation or higher impact agriculture. The area in question is also considered too small to generate noteworthy financial benefit from agricultural activities due to its low carrying capacity.

The solar-power generation potential of the Prieska / Copperton area, particularly in proximity to the Cuprum / Kronos Substations, is significant and will persist should the no-go option be taken. The 'No-go/Status Quo' alternative will limit the potential associated with the land and the area as a whole for ensuring energy security locally, as well as the meeting of renewable energy targets on a provincial and national scale. Should the 'do-nothing' alternative be considered, the positive impacts associated with the solar facility (increased revenue for the farmer, local employment and generation of electricity from a renewable resource) will only be partially realised by the already approved projects and will also not have any further agricultural benefits.

The no-go alternative is thus not considered a favourable option in light of the benefits associated with the proposed solar facility development, however it will be used as a baseline from which to determine the level and significance of potential impacts associated with the proposed solar development during the Impact Assessment phase of the on-going environmental process.

3.3 ASSOCIATED INFRASTRUCTURE OPTIONS

3.3.1 Grid Connection and Cabling

The electrical feeding line is proposed to be constructed to connect to the **ESKOM Kronos Substation** via a self-build powerline option. This electrical power line would run along the border fences and powerline (grid connection) corridor to minimise the effect on the environment.

A 75 MW installation will have various electrical components to meet the national grid code requirements in order to supply generated electricity onto the national grid. The installed infrastructure will ensure the correct conversion of produced power from the generated panel Direct Current (DC) to Alternate Current (AC). This conversion from DC to AC is done by means of inverter stations. A single inverter station is connected to a series of arrays and would be placed along the service roads to give quick and easy access.

A number of inverter stations will be installed, of which each of these inverter stations are connected to the on-site substation from where a power line is constructed. The power line is constructed from the onsite substation to the point of supply either directly to the ESKOM substation or onto an existing power line (loop-in/loop-out).

The final placement of the inverter stations and on-site substation would take the ground conditions into consideration, meaning that suitable areas with a minimal impact on the environment would be preferred. Interconnecting cables may be trenched if required, although the amount of trenching will be reduced as far as practically possible. Cabling would be mounted to structures as far as possible to avoid excessive excavation works and clearing of vegetation.

An inverter station would typically be built into a transportable container and will have an onsite footprint of 56 m² (14m x 4m). The on-site substation is expected to have a footprint of approximately 10’000 square meters (including a switching station, IPP transformer, IPP HV yard, ESKOM HV yard, switch gear and feeder bays).

3.3.2 Grid Connection and Power line Routes

Several “self-build” and “Loop-in/Loop-out” (LiLo) power line route options would have been investigated, however only self-build options are being considered for this proposal. Due to the planned decommissioning of the Cuprum/Hydra 132kV powerline a LiLo grid connection option is eliminated from the grid connection considerations for this project.

Self-build from proposed onsite substation 1

The self-build option “Humansrus Solar 3_Selfbuild_PLine Kronos_sub1”connects from proposed onsite substation 1 to Kronos Eskom substation. This proposed power lines route illustrated in Figure 19 follows the corridor east of the R357 road, crossing the Hoekplaas 146 property, towards the Eskom Kronos substation.

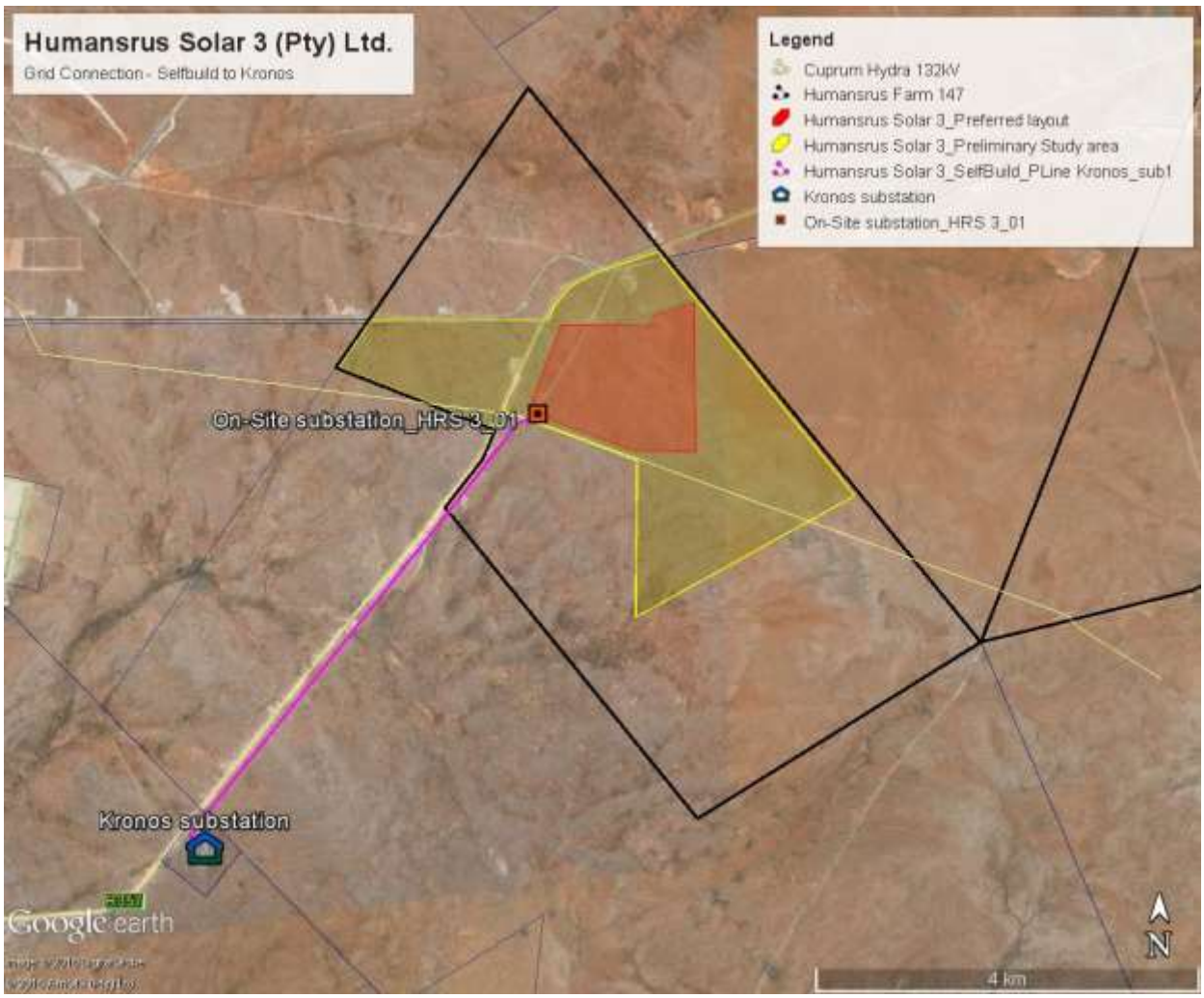


Figure 19: Self build option to Kronos Substation (Solek, 2015)

The grid connection distance from the onsite substation to the Eskom Kronos substation is ±6km. It is expected that other "Independent Power Producer" projects will utilise this similar route towards Kronos substation and as such a corridor adjacent to the R357 is kept open for this purpose.

3.3.3 Auxiliary Buildings

The main storage, workshop, ablution, and administration facilities are placed in an area where there will be easy access.

The final storage and administration areas would also be selected to minimise their impact on the environment by considering the ground conditions and the ecology of the surrounding areas. Since this area may host more human activity than most other parts of the solar facility, it is important to take the surrounding habitat into consideration.

The structure erected should not be more than 2000m² in area and is referred to in Figure 18 above as the Storage and Admin facility. Water to the facilities will be supplied by twenty 10 kl water tanks. These tanks will also be used as redundant water for operation of the plant.

3.3.4 Access & Internal Road Network

Access to the site will be along appropriate provincial and local roads. The proposed access roads to the site are from the Prieska/Van Wyksvlei road. The road has a tarred section and a gravel section. In this impact phase of the project three access road alternatives are considered. All three access road alternatives provide access to the proposed site from the R357 Prieska Vanwyksvlei as access routes illustrated in Figure 11.

A Transport and Traffic Management Plan is included within this environmental impact phase, as required by DEA regulations. This traffic management and transportation plan investigates, plan and describe implications around increased traffic loads and potential route scenarios. Please refer to the "Transport and Traffic Management Plan" (Humansrus Solar 3 Transport and Traffic Management Plan, March 2016).

Different access route alternatives towards the two site alternatives are described within this section of the report. Figure 11 depicts the footprint of the study area and the three proposed access road alternatives.

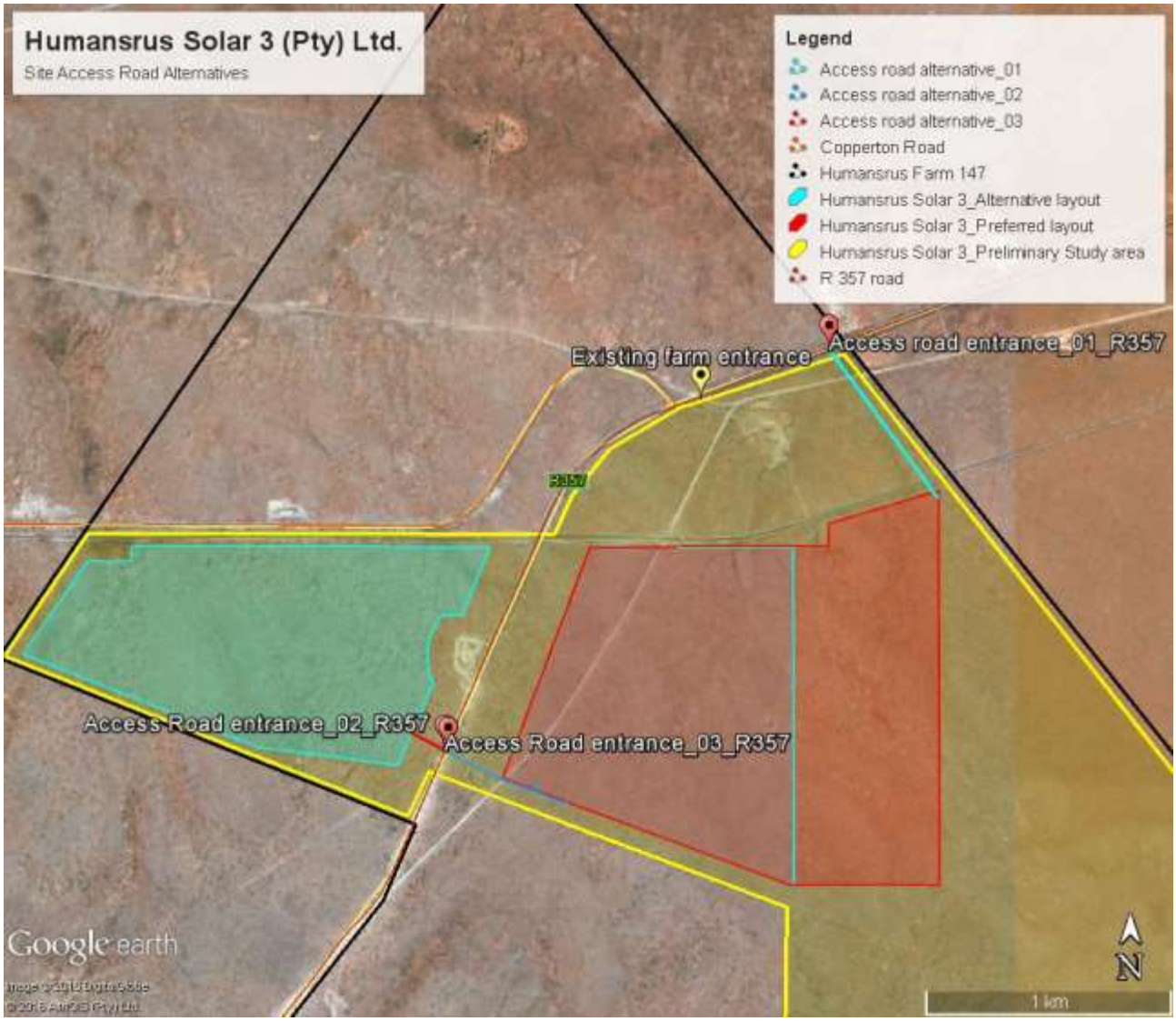


Figure 20: Site access route alternatives (Solek, 2015)

i. Alternative 1

Access road alternative 1 has been investigated and provides access to the project site from the R357 (Prieska/Copperton road). The access is located close to the existing farm border.

Alternative site access road 1 is considered as it provides direct access from the R357 road to the North corner of the proposed preferred site.

ii. Alternative 2 (Preferred road access)

Access road alternative 2 has been investigated and provides access to the project site from the Prieska/Van Wyksvlei road. Alternative site access road 2 is considered as it provides direct access from the Prieska/Van Wyksvlei road to the east of the road and gives easy access to the planned on-site substation and laydown area of the preferred site.

This route is the preferred access alternative.

iii. Alternative 3

Access road alternative 3 has been investigated and provides access to the project site from the Prieska/Van Wyksvlei road. Alternative site access road 3 enables access to the farm portion which is located to the western side of the road on which the alternative site is located. Alternative 3 is located opposite of the Alternative 2 which gives access to the eastern side of the property.

Note that as part of the Environmental Impact assessment the access road alternatives were given to the provincial road department. The provincial road department gave Humansrus Solar 3 PV Facility a letter of no-objection for the various access road alternatives from the R357 road, subject to standard requirements.

It should be noted that specific road corridors for the landowner are allocated and planned for in order to maintain full access for the farmer to the remaining extent (where the solar facility is not developed) of the property.

In the case where access roads cross the washes or where they are in the close vicinity of the washes special care and precautionary measures must be taken to mitigate the risk of erosion due to ground disturbances. By incorporating precast concrete infrastructure into the construction of these roads the risk of the roads acting as water channels could be avoided. Special attention to drainage, water flow and erosion will be given and potential risks will be mitigated by applying appropriate building methods.

A “storm-water management plan” has been developed as part of the impact assessment which will detail consideration towards storm-water infrastructure.

3.3.5 Water Requirements

The project requires about **8 litres of water per panel** per annum for the purposes of construction and maintenance (cleaning of the panels). The capacity of the panels that will be used will therefore determine how much water will be required for a 75MW plant. If a 250 Watt panel is used, a 75MW plant will consist of more or less 300 000 panels, which will roughly calculate to **6.6-8 kl** of water required per day (2’400-2’ 900m³/annum). The 20 x 10 kl capacity tanks will be placed on site in order to store 200 000 litres of water at any given time, effectively providing a storage capacity of two to four days of cleaning water supply. The water distribution system will distribute water from the twenty 10kl water tanks to a high pressure hose and on to the solar panels, or into cleaning equipment (whether moveable or fixed systems). The proposed activity is not a “water intensive activity” (as opposed to CSP technology).

Only a limited amount of water is required in low rainfall periods to clean the modules once every quarter so that they can operate at maximum capacity. No chemicals will be used to clean the panels, only water.

Weather conditions, traffic and general dustiness at the site play a role in the exact amount of water required to clean the solar PV panels. At present it is assumed that each panel should be washed **once every three months**.

To further reduce the use of water at the solar facility, the use of alternative panel cleaning methods is also being investigated. The most feasible technology under consideration uses compressed air to blow off any debris and dust from the panel’s surface. At this stage the technology is being tested and needs refinement before it would be commercially viable. Other cleaning options are currently under development where rotating rubber-based waterless cleaning is used. Cleaning technologies are improving overtime and it is expected that more innovative cleaning technology will be developed, further reducing or eliminating water requirements although these are not fully commercially proven.

The development is expected to apply for a water use authorization or licence, from the Department of Water Affairs, as part of the development process. A water use licence is expected to be required for any water extraction (boreholes, rivers or channels) or for crossing river beds/washes. As far as possible, it is planned to avoid engaging in activities or actions which requires a water use licence, for example the crossing of perennial washes or abstraction of water. The requirements to apply for a water use licence are expected to be confirmed and directed by the appropriate specialists.

Possible water sourced identified at this stage include the following, listed in order of preference:

Boreholes:

The preferred water sources are the existing boreholes on the proposed farm. Two boreholes have been identified on the farm, situated near the proposed site. These boreholes are seen as a possible water option for the facility.

A full pump-test is expected to be done after preferred-bidder status, should borehole water supply remain the preferred water supply, in order to confirm sufficient water supply potential from on-site boreholes; this will further confirm water availability.

The water from boreholes could be pumped to the on-site water tanks through a pipeline, although this will depend on the final location of the water tanks. Should such a water pipeline be required, the pipe diameter will be approximately 50mm-100mm. The pipeline will be laid on the ground, or just below the ground by means of manual excavation. The water pipeline should not result in any additional environmental impacts outside of the main construction area. It is also not confirmed that this route would be required and as such this has not been assessed by any specialists.

The utilisation of water from the boreholes is likely to require a licence in terms of section 21 (a) of the National Water Act which regulates abstraction from a water source. Should it deem possible to avoid the need for a water licence it would be done (for example eliminating water abstraction on-site as an option). A proof of submission of a “Water use licence application” (WULA) will be included within the Final Environmental Impact report should a water use licence be required.

Two minor alluvial water courses were identified by the aquatic specialist within the preferred site layout was assessed. The effect of developing across these two identified alluvial washes is believed to have a negligible effect on the surrounding aquatic environment. The stormwater management plan addresses the risk of erosion and stipulates corresponding mitigation measures. The avoidance of these two alluvial washes would complicate the facility layout and due to the fact that these ratings are low, it is motivated to develop across these two washes. It should however be noted that the amount of cable crossings and internal roads across these two washes is minimised to only a few crossings in order to further mitigate any possible erosion risks

Prieska Copperton Water Pipeline:

An additional option is to obtain water from the existing pipeline which supplies Copperton and Alkantpan with potable water. An approval letter has been received from Alkantpan regarding the availability and use of water. The water is currently being fed, via the constructed pipeline, from Prieska and the Orange River. Should water be drawn from the existing water-pipeline, water will most probably transported with water trucks.

The usage of this “Alkantpan” potable water could potentially avoid the requirement of obtaining a water use licence from the Department of Water Affairs in terms of the extraction of water from resources such as groundwater or rivers (Section 21 (a)).

Siyathemba local municipality (alternative supply):

Permission to use water directly from the nearest town (Copperton) has been confirmed if this option is required. This water will also have to be transported by trucks to the proposed site. This

will be seen as the last alternative as transport costs will be significantly higher compared to the other two options. The usage of municipal water can reduce the requirement of obtaining a water use licence from the Department of Water Affairs in terms of the extraction of water from resources such as groundwater or rivers.

Rainwater:

As an additional measure, PVC rainwater tanks could be placed alongside the on-site buildings to collect the rainwater runoff from the roof. These PVC tanks will then form part of the water storage tanks.

Water storing infrastructure is to be provided as part of the auxiliary building footprint area. Storing capacity for two weeks are planned to be provided for. This will add up to twenty 10 kl water tanks.

3.3.6 Erosion and Stormwater Control

The risk of water erosion is **low because of the extremely low annual rainfall in the area**. The ground condition in the Copperton area is such that large portions of surface water are absorbed into the soil. This avoids water build up on the surface and quickly reduces any water flow which might cause water erosion.

On large structures or buildings **appropriate guttering** could be used around the building to avoid water erosion where roof water would be flowing off the roof. Wherever practically possible rainfall run-off from the roofs/gutters will be captured and stored in rainwater tanks. If this water cannot be captured, water will be channelled into energy dissipating structures to spread the water and slow it down to reduce the risk of erosion. Such a structure could be moulded from precast concrete, loosely packed rock or perforated bags filled with stone.

Any rainfall on the solar modules would be welcomed due to its cleaning effect, but as mentioned before the annual predicted rainfall is very low and would not cause any erosion worth discussing. The solar module surfaces are installed at a relatively large incline with gaps between modules. This does not allow significant water build up on the modules while also reducing the energy in falling droplets. Should a tracking technology be used this implies that droplets leaving the solar module surface would not drop onto the same ground areas all the time.

The construction area might cross over a number of seasonal washes. To avoid erosion in these washes recognised building practices will be followed to keep the natural flow of water within its natural borders. It is in the interest of the solar operator to keep the area clean and free of erosion to avoid any damage to the equipment. The solar modules would be installed on frames, allowing for natural water flow underneath the structure.

During the construction phase of the project there might be a risk of wind erosion where natural vegetation is removed. This might increase the risk of damaging sensitive equipment due to the sandblasting effect. Note that the construction will take place in three phases.

This phased construction approach should also minimise the amount of exposed soil at any one time thus reducing the risk for wind erosion and dust generation. Once the construction on each phase is complete the cleared areas is expected to be re-vegetated with locally-collected seed of indigenous species and left for vegetation to return to the area naturally. Bare areas are envisioned to be packed with brush removed from other parts of the site to encourage natural vegetation regeneration and limit erosion. Any water being used in the cleaning process would speed up this natural vegetation rehabilitation process. Further it will also have a bonding effect on the sandy soil, avoiding the loose sand blowing away causing wind erosion.

Access roads and internal roads will be built using recognised erosion and storm water management systems. During the construction phase of the solar PV facility temporary solutions

would be implemented to ensure that the environment is preserved in a sustainable way by avoiding erosion.

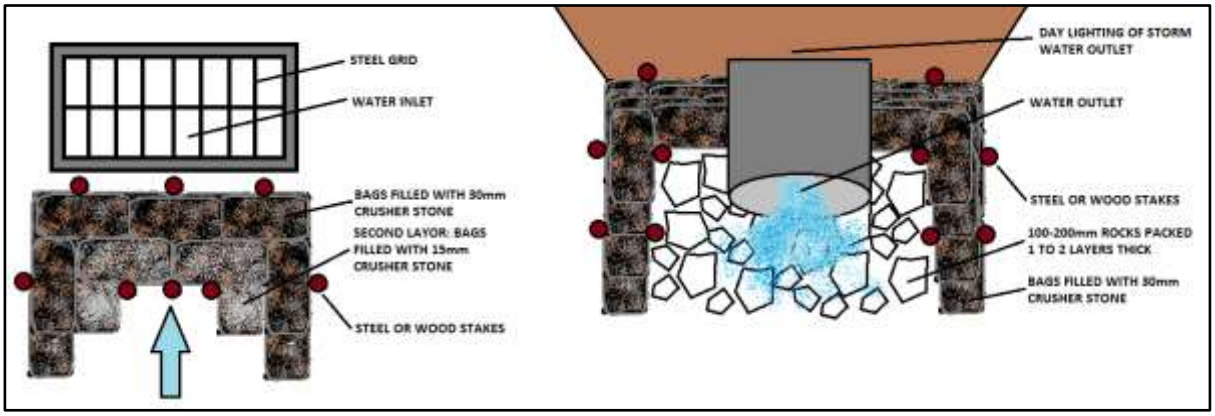


Figure 21: Temporary culvert inlet and outlet (Solek, 2016)

More permanent solutions would be designed to keep storm water under control in a sustainable way. These structures would be built to be aesthetically pleasing by using fixtures such as stones packed in wire mesh (gabion baskets) to stay in a position or interlocking retaining walls at the inflow and outflow of the culverts also acting as scour protection.

An alternative to culverts considering drainage line crossings, Low-level River Crossings (LLRC) can be used. A LLRC is a structure that is designed in such a way to provide a bridge when water flow is low, while under high flow conditions water runs over the roadway, without causing damage.

Two types of LLRC can be used depending of the particular situation. A “Causeway” contains openings underneath the surface, which allows passing water through where a “Drift” does not.

The same type of erosion control methods discussed with the culverts is taken into account when designing a LLRC. Because a LLRC is designed for water to flow over it, erosion protection is very important. Rock filled baskets, loosely packed rock or perforated bags filled with stone are some of the methods usually considered with LLRC.

The water use licence application process will include application for potential crossings of water courses in terms of Section 21(i) & (c) of the National Water Act. This application process will only commence if the project is selected as a preferred bidder.

3.3.7 Traffic Management and Transportation of Solar Equipment

The traffic management and transportation section relates to all impacts the project will have on traffic and transportation infrastructure with a specific reference towards personnel transport, supplies, equipment and infrastructure transport.

All solar plant components and equipment are to be transported to the planned site by road. Construction is expected to stretch over a period of approximately **12-18 months**. The Transport and Traffic plan will provide more detail on the traffic volumes, impact and corresponding regulations with regard to transportation of material and personnel which will be compiled within the impact phase.

The majority of infrastructure required for the facility installation (PV modules, substructures, cabling, inverters and other components) will be transported to the site during the construction period. The entire project requirements are planned to be transported via road to the project site. Most of the infrastructure will be transported within standardised containerised units and corresponding container trucks (e.g. 2 x 40 ft container trucks or a similar option). The mentioned transport and traffic plan further investigates the specific routes to be used and the corresponding impact of the increased traffic on these routes, please refer to the “Humansrus Solar 3 DEIR Transport and Traffic Management Plan, March 2016”.

As per transportation and traffic management plan the project has a total capacity of 75MW which would therefore require 3000 to 4000 heavy vehicle trips. The estimated time period for construction is nine months to a year, averaging 15-20 trips/ day, which is not expected to have a significant effect on peak hour traffic.

The Transport and Traffic plan provides more detail on the traffic volumes, impact and corresponding regulations with regard to transportation of material and personnel.

Normal construction traffic will also need to be taken into account. The usual civil engineering construction equipment will need to be transported to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.). The components required for the establishment of the on-site substation power line will also need to be transported to the site. Some of this power station equipment may be defined as abnormal loads in terms of the Road Traffic Act (Act No.29 of 1989). Input and approval are to be sought from the relevant road authorities for this purpose prior to the commencement of the construction phase.

The amount of hazardous substances on site is expected to be limited to fuel such as diesel and petrol. The transportation of these hazardous substances (should be done according to best transportation practices as stipulated by SANS and the National road act.

The transportation and traffic management plan further stipulates the adherence to these regulations. The onus towards complying with best practices should be on the service provider and overall project management of the project during construction.

Transport to the site will be along appropriate national, provincial and local roads. The access roads to the proposed site will be from R357 Van Wyksvlei road. This is a tarred provincial road and becomes a gravel road 625m south of the bridge crossing the decommissioned railway and no alterations should be necessary to handle construction traffic and traffic involved in the operation phase.

In some instances, the smaller farm roads may require some alterations (e.g. widening of corners etc.), due to the dimensional requirements of the loads to be transported during the construction phase (i.e. transformers of the on-site substation). Permission from local authorities has been obtained (letter of no-objection). Further approval in terms of their generic requirements will be obtained as required prior to construction for site access and entrance road authorisation. The exact access routes that are considered are discussed in more detail within the layout report (Humansrus Solar 3 DEIR Layout Report, March 2016).

3.3.8 Internal Roads

Two type of roads will be required for the facility, the first being the access road to the facility from the R357 Van Wyksvlei road (as discussed in detail within the Humansrus Solar 3 PV Facility Layout report). The second type of road required are internal maintenance roads on the farm and proposed construction site. Where necessary, gravel may be used to service sections of the existing road on the farm itself. The construction of internal roads could require the removal of some existing vegetation and levelling of exposed ground surface should this be found necessary.

These internal roads/tracks (typically 6 m wide or less) will form part of the development footprint. In order to allow enough space for the larger vehicles to turn easily a width of 6m will be proposed. The final and detailed layout and alignment of these internal roads will be planned and influenced by the recommendations made by the botanical specialist, as well as the topographical survey. Pathways (typically less than 4 m wide) between the solar PV modules are to be provided for ease of maintenance and cleaning of the modules.

In addition, a fire break (buffer area), which can also serve as an internal road, will be constructed around the perimeter edges of the entire proposed site. To summarise the different sizes of roads,

internal roads and tracks: The main access road will be less than 8m wide, the internal roads will be approximately 6 m wide, while the internal tracks between PV modules will typically be less than 4m wide.

3.3.9 Temporary Layout Area

An appropriate laydown area is planned for to reduce the environmental impacts of the project during its construction phase. The laydown area will be an open area within the facility area where modules, frames and material will be stored and staged during the facility construction and assembly phase. The laydown area has a high probability of being fenced off, although this is not necessarily the case. The laydown area could be an area of approximately 5ha. Note that the laydown area is a planned temporary storage area which is planned to be used during the construction phase of the project.

3.3.10 Waste / Effluent Management

- Solid Waste

During the construction phase, an estimated amount of **less than 5m^3 non-hazardous solid construction waste will be produced per month** for the expected 18 month construction period. All construction waste will be safely stored in containers and be removed from site on an ad-hoc basis by the appointed construction contractor, as and when deemed necessary. The construction waste will be **disposed of at an appropriately licenced Municipal landfill site**. Management measures for the appropriate storage of all construction-related waste will be included in the Environmental Management Programme (EMPr) to be developed during the EIR phase.

No solid wastes will be generated during the operational phase.

- Sewerage

Chemical toilets will be used by construction staff during the 18-month construction phase. This sewage will be collected by sealed containers/tank trucks (honey-suckers), removed from site and treated by a service provider at an approved facility off site.

During operation, sewage generated from the on-site ablution facility is to be treated on-site by means of a **septic tank system**. Should the Local Municipality not permit the use of sceptic tanks, sewage will be stored in an underground conservancy tank, to be collected (via a honey-sucker) by a service provider (likely the Municipality) and treated at an approved facility off site.

Confirmation of service capacity has been obtained from the Local Municipality during the environmental process.

3.3.11 Pre-Construction, Construction, Operation & Decommissioning Phases

The **preconstruction phase** includes:

1. Conducting of surveys;
2. Appointment of contractors and sub-contractors;
3. Transporting of the required construction components and equipment to site; and
4. Pre-site preparation (establishment of temporary services for construction such as lavatories, water, health and safety requirements, site office, etc.)

The **construction phase** includes:

1. Transportation of solar components and equipment to site;
2. Establishment of internal access roads;

3. Undertaking site preparation (including clearance of vegetation; stripping of topsoil where necessary);
4. Erecting of solar PV frames and panels;
5. Cabling (DC) low and medium voltage (LV/MV);
6. Installing of inverter rooms;
7. Establishing the underground connections between PV panels and inverters;
8. Constructing the on-site substation;
9. Establish connections between inverters and on-site substation;
10. Establishment of additional infrastructure (workshop and maintenance buildings);
11. Connection of on-site substation to power grid;
12. Undertaking site remediation; and
13. Construction of perimeter fencing.

The activities that will be undertaken on site fall under different specialist fields and include:

- **Civil works:** site preparation, site grading, drainage, roads, foundations, storm water & anti-erosion management and site remediation.
- **Mechanical works:** piers/sub-structure installations, mechanical assembly including trackers; mounting of panels; substation delivery, and lastly the installation of perimeter fencing.
- **Electrical works:** installation from low to high voltage, including substation connections.

This process is likely to take 15 to 18 months to complete, during which time **+/- 400 construction employment opportunities** will be created at peak, with **+/- 65 direct employment opportunities** created. It is recommended that local labour be used as far as possible during the construction phase.

- ***Operation Phase***

The solar facility will be operational during daylight hours, except during maintenance, poor weather conditions or breakdowns. Regular maintenance will typically include periodic cleaning, greasing of bearings and inspection. The solar panels will be cleaned with water or compressed air.

An estimated total of **six full-time staff members** will typically be required during the operation phase of the project, which includes technicians, maintenance and security personnel. Approximately **three unskilled labourers will be needed for maintenance purposes and two security personnel will be deployed on a shift basis**. **One skilled staff member will be needed to manage and oversee the operations**. From time to time additional contract staff may be required for ad-hoc ground cleaning or special panel cleaning (total of 75 – 86 employment opportunities).Staff can be transported around the site using utility vehicles and a typical mini-bus will transport staff to and from nearby towns of Prieska / Copperton and surrounding community.

- ***Project Decommissioning / Upgrade***

The proposed solar energy facility is expected to have a **lifespan of approximately 20-25 years** if the specified periodic maintenance is performed. Once the facility has reached the end of its economic life, the infrastructure is to be disassembled and replaced with appropriate or more advanced technology. Should replacement not be deemed necessary, then the facility would be completely decommissioned i.e. all infrastructure will be disassembled and removed from site. Site

decommissioning activities will ensure integrity of access to the site, as well as rehabilitation as necessary.

The components would be disassembled, reused and recycled where possible, or disposed of in accordance with regulatory requirements. Functional components will be donated to and installed at local schools and clinics to benefit the local community.

4 SITE DESCRIPTION AND ATTRIBUTES

The following sections provide a description of the environmental and built context of Farm 147 Humansrus, with particular focus on the proposed Humansrus Solar 3 PV Facility site.

4.1 LOCATION & BUILT ENVIRONMENT

The target property, the **Farm 147 Humansrus (147)**, is located within the Pixley ka Seme District of the Northern Cape Province, within the jurisdiction area of the Siyathemba Local Municipality. The property is approximately 4769ha is size and is located approximately 50km south-west of the nearest town of Prieska, and approximately 10km east of Copperton. The proposed solar development site is situated adjacent to the R357 Provincial Road, approx. 9km southeast of the existing Cuprum Substation and approx. 6km northeast of the existing Kronos Substation.

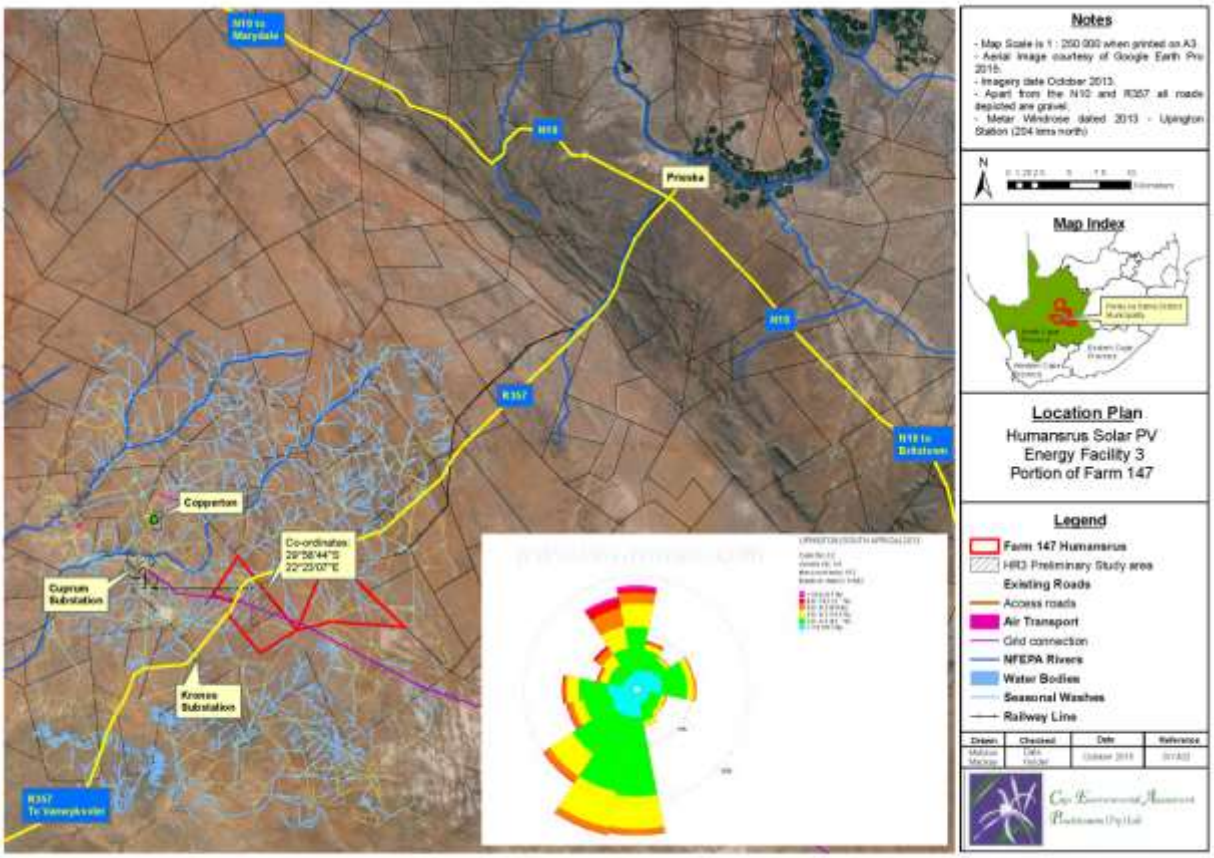


Figure 22: Location plan

The existing Eskom Cuprum and Kronos Substations are located to the west and south respectively. Kronos Substation is approximately 6km from the property and Cuprum Substation is approximately 9km from the property. A number of existing 132kV overhead powerlines connects to these Substations. **Humansrus Solar 3 PV Facility proposes to connect to the Kronos substation.**

The proposed Humansrus Solar 3 PV Facility study-site is approximately 852ha in size and extends from west to east across a portion of the property, south of the R357.

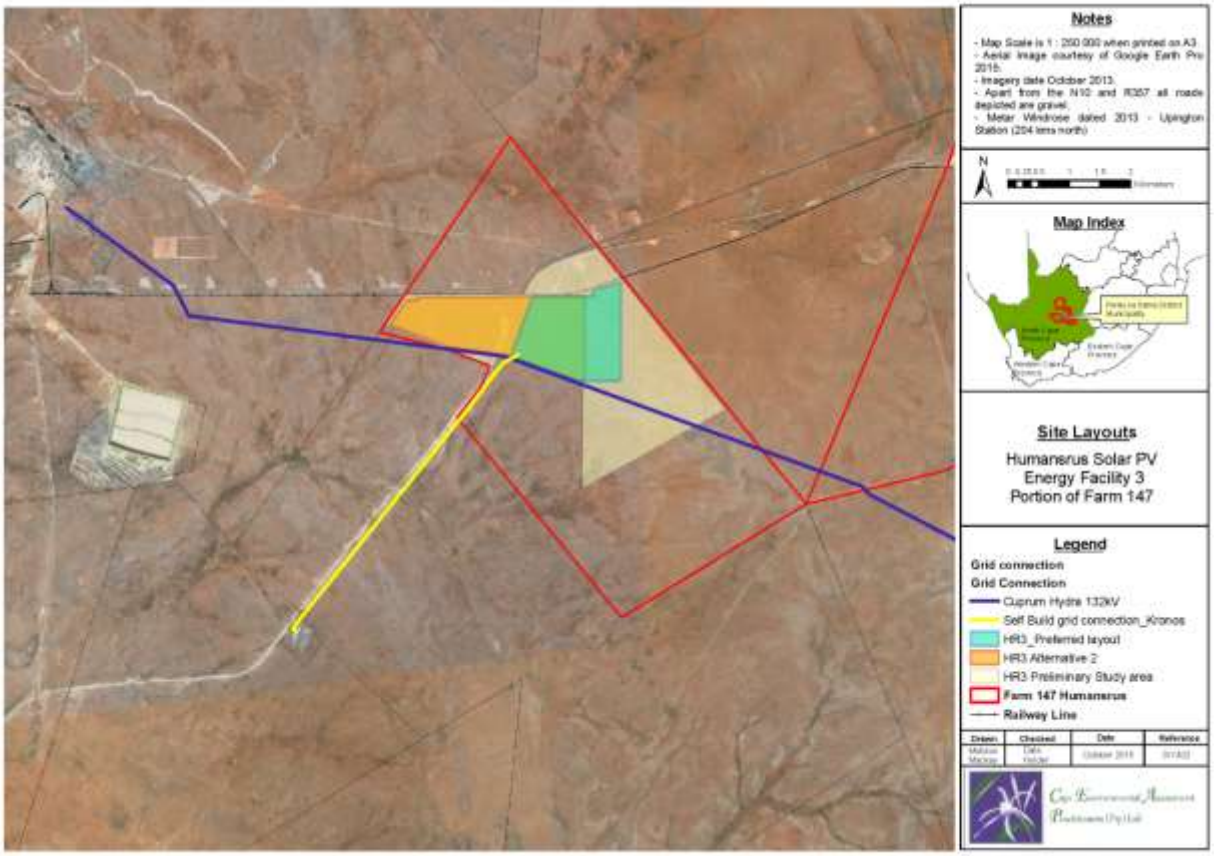


Figure 23: Study site and alternatives

The area is flat with gravel patches across most of the terrain. There are no buildings or significant infrastructure located on the site. A decommissioned railway line runs along the northern boundary of the study site.

Photo 1: Typical landscape of the site

Photo 2: Gravel patches in the landscape

Photo 4: Decommissioned railway line

Photo 3: R357 provincial road

Vehicular access to the site from the R357 is via two existing gravel roads, one which divides the northern section in two and the other associated with the now decommissioned railway line, and is the main route through to Copperton.

Photo 5: View along the R357

Photo 6: Road to Kronos substation

4.2 GEOLOGY & TOPOGRAPHY

Three geological groups coincide on the development site. Dwyka group on the southwestern side; and Transvaal Rooiberg Griqualand-West on the northwestern group and Waterberg Soutpansberg, Orange River on the eastern side. Refer to Figure 24 below.

Sedimentary and Volcanic rocks of these groups are Tillite, Mudstone and Schale.

The lithology is unconsolidated sand over laying gravel, over laying calcrete, over laying sand and siltstone.

Calcic soils can be expected to found on this geology and under arid climatic conditions.

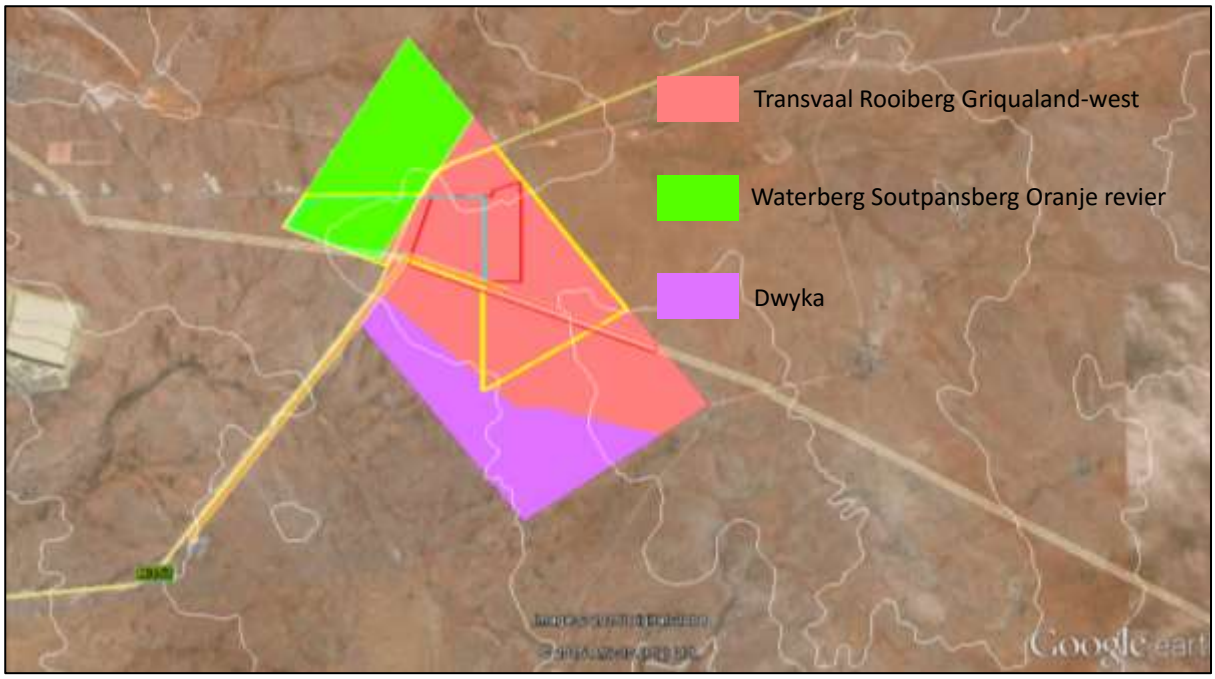


Figure 24: Geology on the study site (Lubbe, 2015)

The topography has low relief. The slope gradient is between 0 and 2% with a concave shape. Some small pans occur (Figure 25).

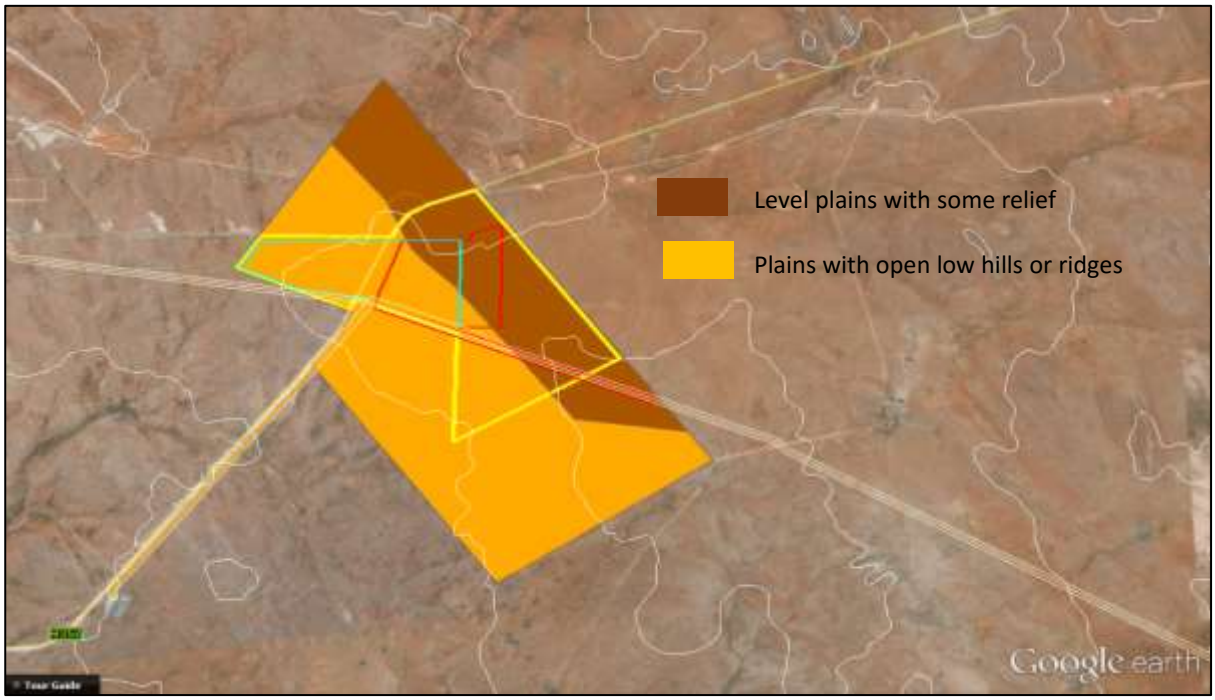


Figure 25: Topography (Lubbe, 2015)

4.2.1 Soil Types

The occurrence of soil units in South Africa were systematically mapped by the Soil and Irrigation Institute, which compiled an inventory for each land type in terms of terrain, soil and climate parameters.

A land type is an area with similar climate, topography and soil distribution patterns -which can be demarcated on a scale of 1:250 000. Two land types dominate the study area, namely Ah93 and Ag154 (Figure 26).

A-land types refer to regions where freely drained yellow and red soils occupy more than 40% of the land area. The soils of A-land types are generally considered to be good for crop production and suitable for irrigation. Since these soils are freely drained, saturation seldom occurs, thereby reducing the chances of erosion. Ah land types (Ah93 in Figure 26) refers to an area where more than 40% of the soils are red, high base status soils deeper than 300 mm, but shallower than 750mm. Ag154 (see eastern side of Figure 26) refers to soils shallower than 300mm. The agricultural potential of the land covered by Ag154 is low and land-use restricted to low intensity grazing, due to climatic constraints. The potential of large parts of the land type can however be dramatically increased should adequate irrigation water be available.

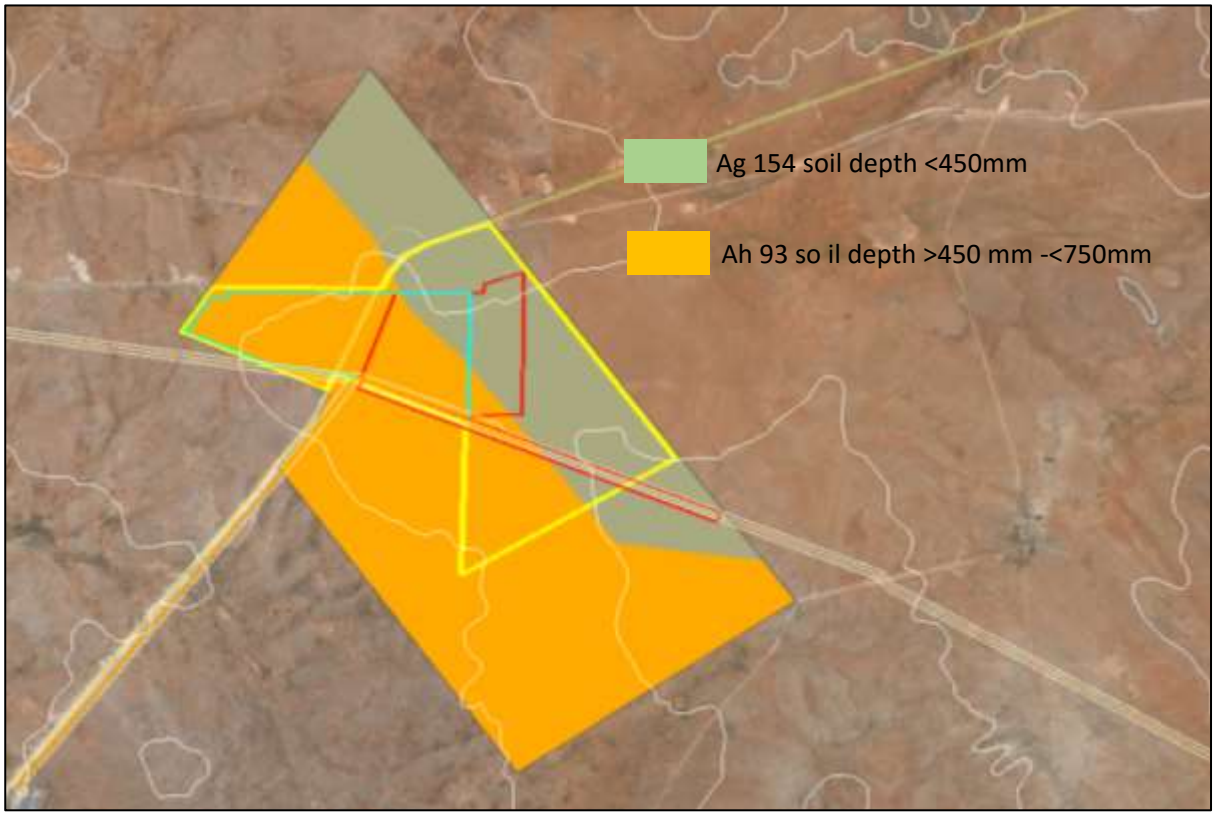


Figure 26: Soil types on the study site (Lubbe, 2015)

Table 3 reflects the specific soil properties that can be expected:

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

Table 3: Soil Properties (Lubbe, 2015)

Property	**Western side**	**Eastern side**
Classification	Red/Yellow freely drained High base status	Red/Yellow freely drained High base status
Water holding capacity	<20mm/m	21-40mm/m
Texture	<15%	<15%

Property	Western side	Eastern side
Effective depth	>450mm <750mm	<450mm
Textural contrast	Clear transitions present	Abrupt transitions present
Swelling clays	Very low	Very low
Natural organic carbon content	<0.5	<0.5
Natural pH	7.5 – 8.4	7.5 – 8.4
Leaching status	Calcareous	Eutrophic
Cation exchange capacity	6.1 -10	6.1 – 10

4.2.2 Drainage

The drainage is limited to small intermittently active streams and pans. The nett flow is to the west (Rooidam).

The site falls in the Orange Water Management Area, catchment D54D. See Table 4 for additional information.

The proposed development will have a low interference in drainage because of terrain position.

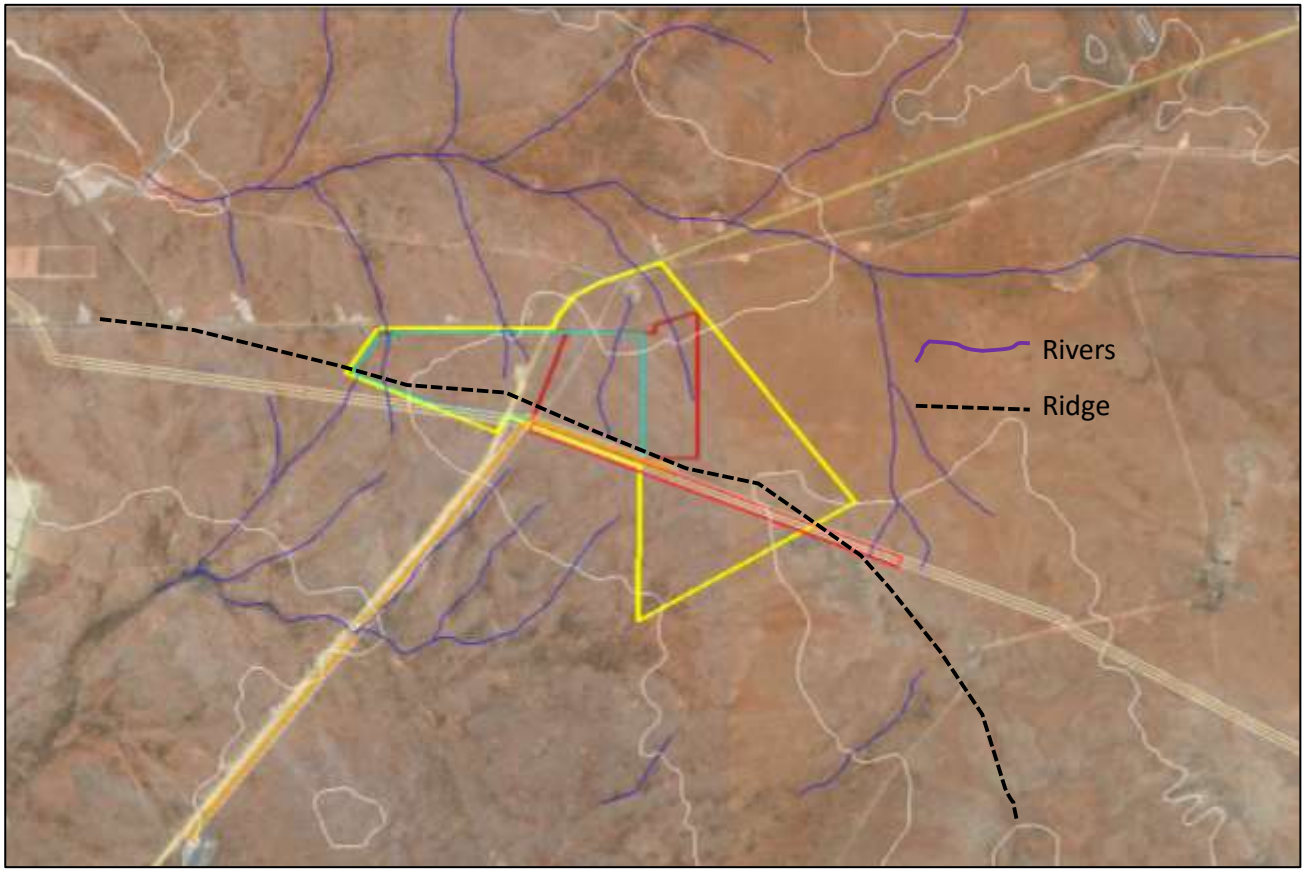


Figure 27: Site drainage (Lubbe, 2015)

Table 4: Water management area (Lubbe, 2015)

Attribute	Description
Water Management Area	Orange
Catchment area	D54D
Terrain position	Plateau
Reference to waterbodies that may be effected	Rooi dam:130km NW Van Wyksvlei dam:70km SW

4.3 VEGETATION

According to the national vegetation map (Mucina & Rutherford 2006), the site straddles two vegetation types, **Bushmanland Arid Grassland** in the east and **Bushmanland Basin Shrubland** in the west. These are both extensive vegetation types that have not been impacted to a large degree by transformation and are classified as **Least Threatened**.

Bushmanland Arid Grassland is the second most extensive vegetation type in South Africa and occupies an area of 45478 km^2 and extends from around Aggeneys in the west to Prieska in the east. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300 mm deep. Due the arid nature of the unit which receives between 70 and 200 mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact and its' conservation status is classified as Least Threatened. Mucina & Rutherford (2006) list 6 endemic species for the vegetation type which is relatively few given the extensive nature of the vegetation type.

Bushmanland Basin Shrubland is also among the most extensive vegetation types in South Africa with an extent of 34 690 km^2. Bushmanland Basin Shrubland occurs on the extensive basin centered on Brandvlei and Van Wyksvlei, spanning Granaatboskolk in the west to Copperton in the east, and Kenhardt in the north to around Williston in the south. The area is characterized by slightly irregular plains dominated by dwarf woody shrubs, with succulent shrubs or perennial grasses in places. The geology consists largely of mudstones and shales of the Ecca group and Dwyka tillites with occasional dolerite intrusions. Soils are largely shallow to non-existent, with calcrete present in most areas. Rainfall ranges from 100-200mm and falls mostly during the summer months as thunder storms. As a result of the arid nature of the area, very little of this vegetation type has been affected by intensive agriculture and it is classified as Least Threatened. There are few endemic and biogeographically important species present within this vegetation unit and only *Tridentea dwequensis* is listed by Mucina and Rutherford as biogeographically important while *Cromidon minimum*, *Ornithogalum bicornutum* and *O.ovatum* subsp *oliverorum* are listed as being endemic to the vegetation type.

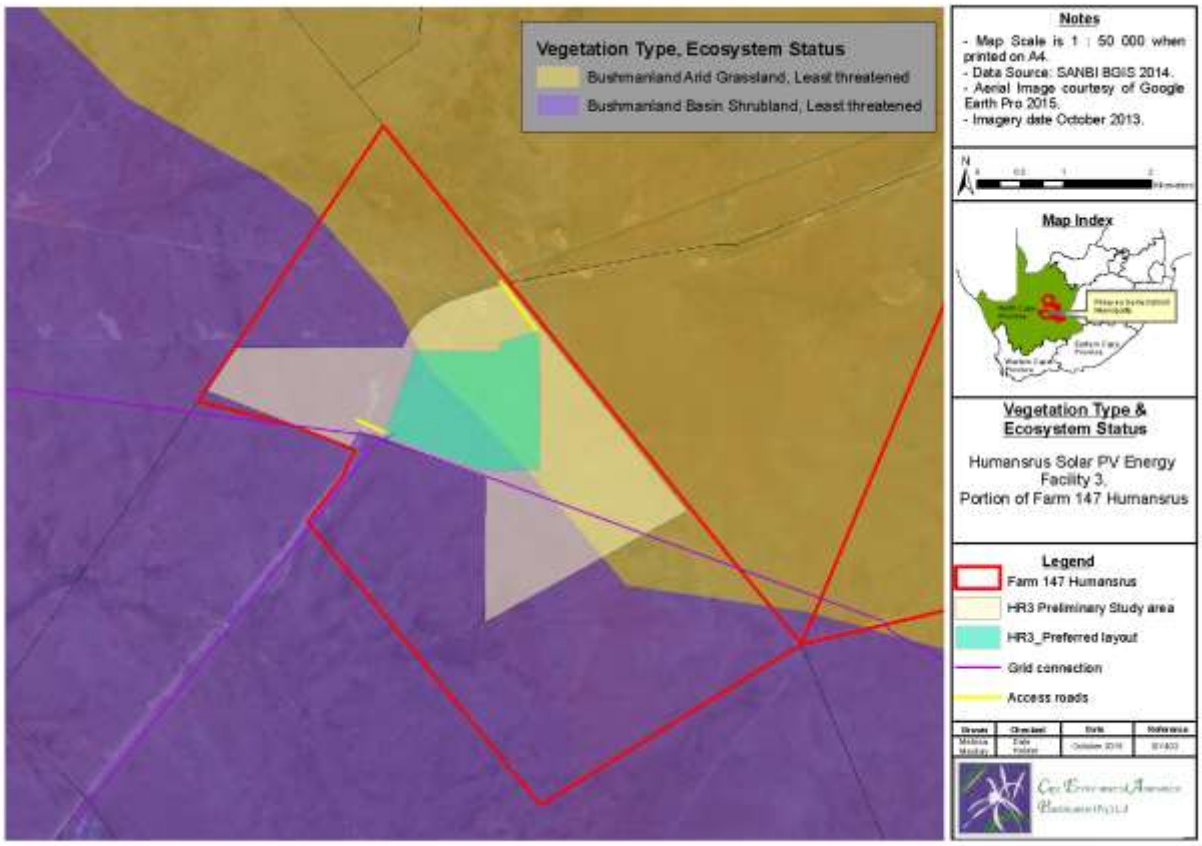


Figure 28: Vegetation Type

In terms of observations of the plant communities in this area, previous site visits suggest that most of study area is typical of Bushmanland Basin Shrubland. Soils are generally shallow silty soils which favour shrubs over grasses which usually dominate on more sandy soils. Typical species include *Zygophyllum lichtensteinianum*, *Lycium cinereum*, *Hermannia spinosa*, *Pteronia sordid*a, *Pteronia inflexa*, *Osteospermum armatum* and *Aristida adscensionis*. Towards the northern margin of the site, there are some deeper soils present with taller, more dense vegetation present, typical species include *Phaeoptilum spinosum*, *Lycium horridum* and *Rhigozum trichotomum*. There are also some patches of deeper or more coarse soils present which are dominated by grasses, typically *Stipgrostis obtusa*, *Enneapogon desvauxii*, *Stipagrostis ciliata* and *Eragrostis lehmanianna*, while woody shrubs such as *Pentzia incana*, *Ruschia spinosa*, *Aptosimum marlothii*, *Rosenia humilis* and *Pegolettia retrofracta* may also be present in these areas.

Figure 29: The Humansrus Solar 3 PV Facility study area south of the R357 (left) and north of the R357 (right) (Todd, 2015)

The vegetation consists of a low dwarf shrubland with few grassy areas present.

Looking across the Humansrus Solar 3 PV Facility site from the eastern boundary towards the R357 which can be seen in the distance where it rises over the railway line. Although this part of the site is mapped as Bushmanland Arid Grassland, the vegetation is clearly more akin to the Bushmanland Basin Shrubland vegetation type.

4.3.1 Listed and Protected Plant Species

According to the SIBIS database, only two red data-listed plant species are known from the area, *Hoodia gordonii* which is listed as DDD (data deficient, insufficient information) and *Salsola apiciflora* which is listed DDT (Data Deficient – Taxonomically Problematic). There are however a variety of nationally or provincially protected species present in the area which have been observed during previous site visits to the area. Perhaps the most common is the nationally protected tree species *Boscia albitrunca* which is particularly common in the rocky hills but occurs scattered on the plains as well. *Harpagophytum procumbens* is associated with red sands in the area and may be present at the site. This species is protected at the national and provincial level on account of its' popularity as a medicinal plant. It is however not rare and the population is estimated at several million plants. Other protected species observed during previous studies in the area include *Hoodia gordonii*, *Hoodia flava*, *Lithops halli*, *Titanopsis calcarea*, *Pachypodium succulentum*, *Mestoklema tuberosum*, *Aloe claviflora*, *Avonia ustulata* and *Boscia foetida*. Many of these species are associated with certain habitats such as quartz or calcrete patches and their presence at the site would depend largely on the presence of these features. This can only be verified in the field, but it is unlikely that many of these species occur at the site as previous visits to the area suggest that the site is not likely to fall within a highly sensitive area.

4.4 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

No fine-scale conservation planning has been conducted for the region and as a result, no Critical Biodiversity Areas have been defined for the study area. In terms of other broad-scale planning studies, the site does **not fall within a National Protected Areas Expansion Strategy Focus Area** (NPAES), indicating that the area has not been identified as an area of exceptional biodiversity or of significance for the long-term maintenance of broad-scale ecological processes and climate change buffering within the region. See **Appendix B** for Biodiversity Overlays.

Due to the large number of developments in the area the potential for cumulative impacts is high. A map of all the DEA-registered renewable energy developments in the area is depicted in Figure 30 below and illustrates the current development site surrounded by other renewable energy developments. The map shows the high density of the development in the area, which is driven by the presence of the Kronos and Cuprum substations several of these are already constructed or currently under construction.

However, the DEA map does not indicate the actual footprint of the facilities which are in most cases much smaller than the cadastral units indicated. Therefore, there are still large undeveloped gaps between the different projects. Nevertheless, cumulative impacts resulting from the development are clearly a concern and the potential disruption of the landscape due to the development will need to be investigated during the EIA phase.

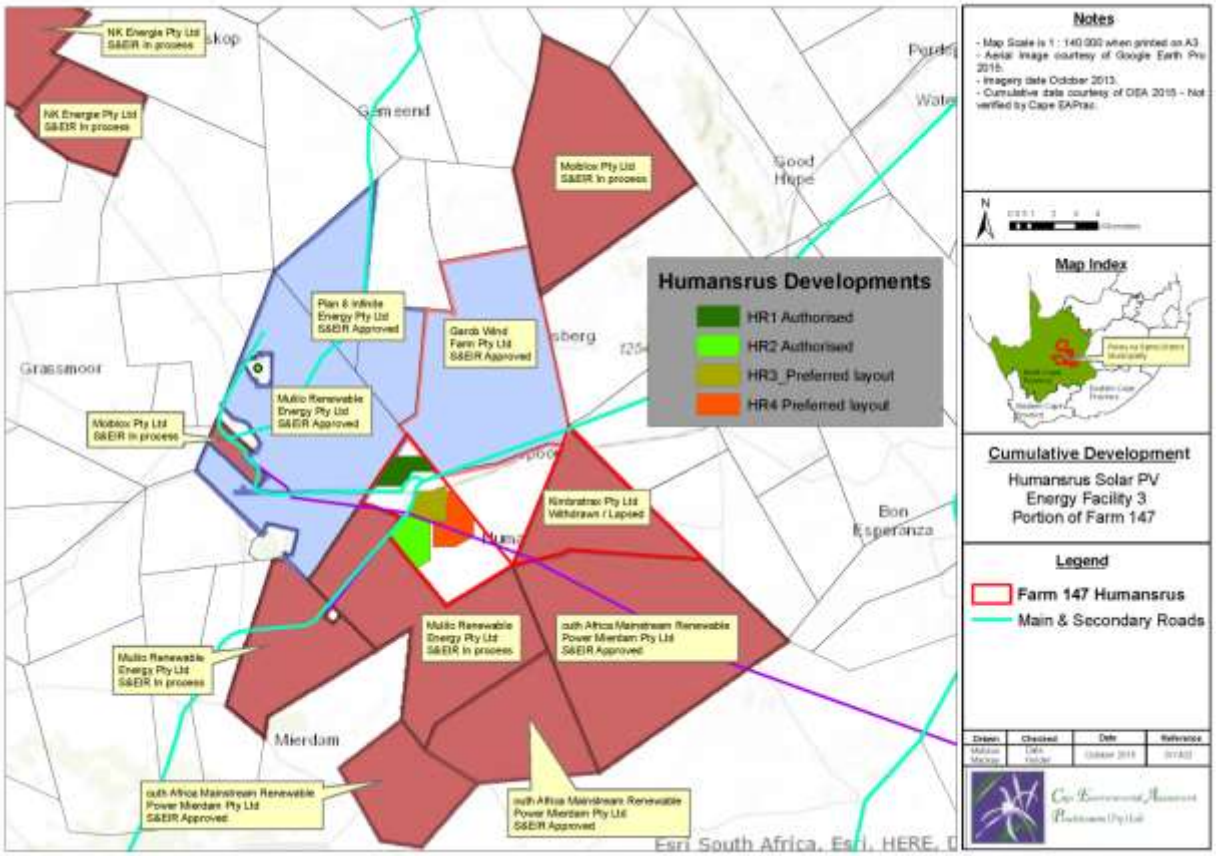


Figure 30: Map of DEA-registered renewable energy projects around the Humansrus site

4.5 FAUNA

Mr. Simon Todd, of Simon Todd Consulting, conducted an Ecological site investigation of the proposed Humansrus Solar 3 PV Facility site (see **Annexure E2**), from which the following is drawn.

4.5.1 Mammals

The site lies within the range of approximately 43 terrestrial mammals, including four listed species. The listed species are the Black-footed cat *Felis nigripes* (VU) Brown Hyaena *Hyaena brunnea* (NT), South African Hedgehog *Atelerix frontalis* (NT) and Honey Badger *Mellivora capensis* (SA RDB EN). All of these species have a wide distribution in South Africa and the loss of 200 ha of habitat would not result in significant habitat loss for these species considering that this less than the home range of a single individual of any one of these species.

Faunal abundance in the area is quite high and a wide array of species has directly or indirectly been observed during the numerous previous site visits to the area. The majority of species that have been observed are medium sized mammals, typical of the area and no particularly rare or notable species were observed. Species that were observed in the area include Cape Porcupine *Hystrix africaeaustralis*, Steenbok *Raphicerus campestris*, Springbok *Antidorcas marsupialis*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Cape Hare *Lepus capensis*, South African Ground Squirrel *Xerus inauris*, Namaqua Rock Mouse *Aethomys namaquensis*, Black-backed Jackal *Canis mesomelas*, Bat-eared Fox *Otocyon megalotis*, Yellow Mongoose *Cynictis penicillata* and African Wild Cat *Felis silvestris*.

Potential impacts on mammals are likely to be restricted largely to disturbance during the construction phase and habitat loss during the operational phase. The current development would occupy no more than 220 ha, which in the current context is relatively little as the landscape is arid

with a generally low density of fauna and the majority of the landscape is still intact. As a result, impacts on habitat fragmentation and landscape connectivity are likely to be relatively low. There are however a number of other proposed and approved developments in the area and so there is some potential for cumulative impacts to be generated as a result.

4.5.2 Reptiles

According to the SARCA database 30 species have been recoded within the quarter degree squares 2922CC, 2922CD, 2922DC, 3022AA, 3022AB, 3022BA, indicating that the reptile diversity in the broad area is relatively low. Species observed in the area previously included the Rock Monitor *Varanus albigularis*, Spotted Sand Lizard *Pedioplanis lineoocellata* and Burchell's Sand Lizard *Pedioplanis burchelii*. There are no rocky hills within the study area, and as a result, reptile diversity within the study area is likely to be low. Only one listed species is known from the broad area, the Karoo Padloper *Homopus boulengeri* (Near Threatened). Although this species may be present, it was not observed during the previous site visits and has not been recorded during SARCA surveys either and if it occurs in the area, would be present at a low density.

In terms of the likely impact of the development on reptiles, habitat loss is likely to be of local significance only due to the relatively small footprint of the development and the relatively low reptile diversity of the site. Furthermore, many species would be able to use the vegetation under the panels and some species would take advantage of the buildings and structures present. Some transient disturbance of reptiles during construction is likely due to disturbance and vegetation clearing. Overall, as there are few range-restricted or listed reptile species at the site, impacts on reptiles from the development is likely to be local in nature and not of broader significance.

4.5.3 Amphibians

Although 11 frog species are known from the broad area around the site, frog diversity within the site is likely to be low. There is no perennial water or pans in the site and the drainage lines are not sufficiently well developed to offer any breeding habitat for amphibians. Species which may at the site are those which are relatively independent of perennial water such as the Karoo Toad *Vandijkophrynus gariepensis*, Common Caco *Cacosternum boettgeri* and Tandy's Sand Frog *Tomopterna tandyi*. Only one listed species is known from the area, the Giant Bullfrog *Pyxicephalus adpersus* which is listed as Near Threatened. This species breeds in ephemeral pans and there do not appear to be any suitable pans for this species within the affected area. Given the low likely abundance of frogs at the site, impacts on frogs are likely to be relatively low, but apart from disturbance, pollution is highlighted as potential impact source for frogs.

4.5.4 Birds

According to the SABAP 2 database 129 species have been recorded from area. Based on a combined list from SABAP 1 and SABAP2, this includes eight listed species. The majority of the listed species are raptors which have been recorded infrequently from the area, suggesting that they are not common residents. The only species which is regularly recorded in the area is Ludwig's Bustard which accounts for as much as 10% of all collisions in South Africa. It is clear that the major impact of the development on birds would potentially be from the power line which could cause mortalities through electrocution and collisions. The possibility of an on-site connection to the existing line would however reduce impacts on avifauna to a very low level. In addition, if this is not possible, then the options which run adjacent to existing similar voltage lines would be considered most preferable.

5 ASSUMPTIONS & LIMITATIONS

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

5.1 GENERAL ASSUMPTIONS & LIMITATIONS

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

5.2 SPECIALIST SPECIFIC ASSUMPTIONS & LIMITATIONS

The following specialists have listed the following specific assumptions & limitations as part of their Impact Assessments:

AGRICULTURAL:

As far as regional information is concerned, this is primarily a desktop-based study. Climatic conditions, land uses, land type and terrain are readily available from literature, GIS information and satellite imagery.

Notwithstanding these limitations, the site-specific field studies confirmed most of the desktop findings the specialist is confident that the findings provide sufficient detail for the agricultural assessment reported in this document.

ECOLOGY:

The specialist made the assumption that the sources of information used in the compilation of this report are reliable. However, it must be noted that there are limiting factors and these could detract from the accuracy of the predicted results:

- There is a scarcity of published, scientifically vetted information regarding the avifaunal impacts at existing SEFs. Recent studies at SEFs (all using different solar technologies) in southern California have revealed that a wide range of bird species are susceptible to morbidity and mortality at SEFs, regardless of the type of technology employed. It must however be noted, that facility related factors could influence impacts and mortality rates and as such, each SEF must be assessed individually, taking all variables into account.

- Assessment of the impacts associated with bird-SEF interactions is problematic due to: (i) limitations on the quality of information available describing the composition, abundance and movements of the local avifauna, and (ii) the complete absence of any local, empirical data describing the known impacts of existing SEFs on birds (Jenkins, 2011).
- Limited time in the field and no seasonal spread means that important components of the local avifauna (i.e. nest sites or localised areas of key habitats for rare or threatened species) could have been missed. However, the development area does not contain many large trees, so it is highly unlikely that there are any significant nesting sites of larger species present within the affected area that would not have been observed.

The site visit as well as the specialists' personal experience of the avifauna of the area and of similar species in different parts of South Africa, through the specialist's experience working across the country, goes some way to remedying any knowledge deficiencies.

AVIFAUNAL:

The specialist made the assumption that the sources of information used in the compilation of this report are reliable. However, it must be noted that there are limiting factors and these could detract from the accuracy of the predicted results:

- There is a scarcity of published, scientifically vetted information regarding the avifaunal impacts at existing SEFs. Recent studies at SEFs (all using different solar technologies) in southern California have revealed that a wide range of bird species are susceptible to morbidity and mortality at SEFs, regardless of the type of technology employed. It must however be noted, that facility related factors could influence impacts and mortality rates and as such, each SEF must be assessed individually, taking all variables into account.
- Assessment of the impacts associated with bird-SEF interactions is problematic due to: (i) limitations on the quality of information available describing the composition, abundance and movements of the local avifauna, and (ii) the complete absence of any local, empirical data describing the known impacts of existing SEFs on birds (Jenkins, 2011).
- Limited time in the field and no seasonal spread means that important components of the local avifauna (i.e. nest sites or localised areas of key habitats for rare or threatened species) could have been missed. However, the development area does not contain many large trees, so it is highly unlikely that there are any significant nesting sites of larger species present within the affected area that would not have been observed.

The site visit as well as the specialists' personal experience of the avifauna of the area and of similar species in different parts of South Africa, through the specialist's experience working across the country, goes some way to remedying any knowledge deficiencies.

HERITAGE / ARCHAEOLOGY / PALAEONTOLOGY:

- Assumptions about the spread and density of archaeological resources are based on archaeological fieldwork conducted on Humansrus in October 2014, as well as on assessments undertaken by other specialists on adjoining properties;
- It is assumed that, given the sparse vegetation of the study area, the presence of archaeological resources should be readily apparent from a surface survey and that test pit excavations will not be necessary to establish the potential of sub-surface archaeology.
- We do not have the comments from the broader local community with respect to the proposed development.

If however, archaeological features or sites (such as burials, ostrich eggshell water flasks, high stone artefact concentrations) are uncovered during constriction, then work will have to cease in that area and SAHRA must be notified. These provisos should be included in the EMP.

VISUAL:

- Information pertaining to the specific heights of activities proposed for the development was limited and, where required, generic heights will be used to define the visibility of the project.
- Although every effort to maintain accuracy was undertaken, as a result of the Digital Elevation Model (DEM) being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence.
- The use of open source satellite imagery was utilised for base maps in the report.
- Some of the mapping in this document was created using Bing Maps (previously *Live Search Maps*, *Windows Live Maps*, *Windows Live Local*, and *MSN Virtual Earth*) and powered by the Enterprise framework.
- The information for the terrain used in the 3D computer model on which the visibility analysis is based on is:
    - The Advanced Spaceborne Thermal Emission and Reflection (ASTER) Radiometer Data (ASTGTM_S2 3E014 and ASTGTM_S24E014 data set). ASTER GDEM is a product of Japan's Ministry of Economy, Trade and Industry (METI) and National Aeronautics and Space Administration (NASA) in USA. (NASA, 2009)
    - The ASTER DEM is utilised as a tool to determine broad-brush terrain variation and smaller scale terrain variations may not be reflected.
- Determining visual resources is a subjective process where absolute terms are not achievable. Evaluating a landscape's visual quality is complex, as assessment of the visual landscape applies mainly qualitative standards. Therefore, subjectivity cannot be excluded in the assessment procedure. (Lange, 1994)
- The project deliverables, including electronic copies of reports, maps, data, shape files and photographs are based on the author's professional knowledge, as well as available information.
- This study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of assessment undertaken. VRM Africa reserves the right to modify aspects of the project deliverables if and when new/additional information may become available from research or further work in the applicable field of practice, or pertaining to this study.

TRAFFIC:

The following Assumptions are made for materials during the construction of Humansrus Solar 3 PV Facility:

- All basic building materials comprising concrete, road materials, etc., will be supplied out of local towns (Prieska and Kimberley) near to the site;
- All inverters and other locally assembled equipment will be delivered from the manufacturing centres, either out of Johannesburg, Gauteng, or Pinetown, KZN;
- All supplementary materials will be imported to nearby Ports and delivered to site via heavy vehicles with legal limits; and
- The 70t transformer that will be imported will require an Abnormal Load permit prior to transportation.

SOCIO-ECONOMIC:

The following assumptions and limitations were relevant to the SIA:

- The 2011 Census is the most recent source of official statistics and this has been used for generating a lot of the information provided in the baseline profile of the study area. In

addition to this, the latest District and Local Municipality policies and plans were utilised in generating information. While the data does provide useful information, it should be noted that this data may now be out of date to some degree and may no longer accurately reflect the current socio-economic profile;

- This study was done with the information available to the specialist at the time of executing the study, within the available timeframes. The sources consulted are not exhaustive, and additional information which might strengthen arguments, contradict information in this report, and/or identify additional information might exist. The specialist did try to take an evidence-based approach in the compilation of this report and did not intentionally exclude scientific information relevant to the assessment;
- A limited amount of finalised project details from the project developer means that some of the actual project projections may be higher or lower than estimated in this report;
- It was assumed that the motivation for, planning and feasibility study of the project were undertaken by the developer with integrity, and that information provided to date by the project developer, the independent environmental assessment practitioner and the public participation consultant was accurate.

PLANNING:

Due to the fact that **no applicable zoning** currently exists for alternative / renewable energy facilities or their ancillary facilities in the Northern Cape Province, it was necessary to apply for rezoning from Agriculture 1 to Special zone, as well as for a long-term lease on Agricultural land for the purposes of the renewable energy facility.

This Scoping & EIR process was undertaken with full knowledge of the above assumptions and cognisance was taken of the limitations as specified.

6 SPECIALIST IMPACT ASSESSMENTS

The following specialist investigations and assessments were undertaken:

- Agricultural Impact Report – Mr Christo Lubbe;
- Ecological Impact Assessment Report – Mr Simon Todd (Simon Todd Consulting);
- Avifaunal Impact Assessment – Mr Blaire Zoghby (Simon Todd Consulting);
- Aquatic Delineation & Impact Assessment (Mr Brian Colloty);
- Integrated Heritage Impact Assessment Report – Mr Stefan de Kock (Perception Planning) including:
    - Archaeological Impact Assessment Report – Ms Lita Webley (ACO Associates);
    - Palaeontological Scoping – Dr John Almond (Natura Viva); and
    - Visual Statement Report – Mr Stephen Stead (VRMA);
- Geotechnical Statement (Carel de Beer, GCS);
- Traffic Impact Assessment (AEP);
- EMI / RFI Path Loss Report (ITC);
- Socio-Economic Impact Assessment – Savannah Environmental.

Copies of the full reports are included in Appendix E.

7 AGRICULTURAL IMPACT REPORT

A specialist Agricultural Impact Assessment was undertaken by Mr Christo Lubbe. The full report is included in **Annexure E1** of this report.

The current land-use is restricted to low intensity grazing. The natural grazing capacity of the site is approximately 35 -40 hectares per large stock unit. The low rainfall, high potential evaporation, high maximum and low minimum temperatures, coupled with shallow soils covering most of the site, limits any additional land-use activities.

Potential impacts on agricultural resources and productivity are low:

- Loss of agricultural land, due to direct occupation by PV panels and other infrastructure, including roads and power lines, for the duration of the project. This will take affected portions of land out of agricultural production.
- Land surface disturbance and alteration of its run-off characteristics due to construction of PV panel foundations, buildings, roads and its resultant potential impact on erosion. Erosion will cause loss and deterioration of soil resources.
- Loss of topsoil due to poor topsoil management (burial, erosion, etc) during construction, with related soil profile disturbance (excavations etc.) and resultant decrease in the soil's agricultural suitability.
- Placement of spoil material generated from construction related excavations which can cover agricultural land and thereby render it unsuitable for the future.
- Generation of alternative farm income is a positive impact of the development on the financial sustainability of farmers.

7.1 CUMULATIVE IMPACTS

The Northern Cape Province, and Prieska and Copperton area in particular, has been identified as one of the most preferred areas for the generation of solar energy in South Africa and even in the world. This is due to the advantageous sun radiation specifications and the flat planes which are not intensively used for agriculture. The DEA is in the process of identifying Renewable Energy Development zones (REDz) across South Africa that are best suited for renewable energy generation. The implication of developing in these areas means that various statutory processes may be streamlined e.g. instead of a full Scoping & EIR process under NMEA, only a Basic Assessment process will be required. The REDZ areas have not yet been gazetted.

Prieska and Copperton are located approximately 74kms south of the Upington REDZ7 zone, and although this area has not been identified as a REDZ, there are a number of renewable energy (wind and solar) projects already authorised or undergoing authorisation processes. This is in part to the suitability of the area for these purposes. The area is located within a Solar Corridor as identified in the Northern Cape PSDF as one of their development corridors.

Overall this has led to increased cumulative impacts on the receiving environment. The various specialists were tasked to include an assessment of the cumulative impacts on the receiving environment.

7.2 IDENTIFICATION OF IMPACTS

7.2.1 Loss of agricultural land

The PV field is fenced and secured, therefore 220 ha is lost for agricultural production.

The soil and environmental conditions of the proposed PV field restrict agricultural production to sheep farming as the only sustainable option. The area fixed with PV panels will take grazing away but at a rate of 40ha/LSU or 7ha/SSU the loss would be 30 sheep.

No mitigation measures can be proposed.

7.2.2 Land surface disturbance, changing run-off characteristics and increasing erosion risks

With the construction of the PV field, the site is cleared from vegetation. With the low rainfall figures, wind erosion, rather than water erosion is possible. For the highest efficiency of the PV panels the aim would be to minimise the dust generated by wind erosion.

7.2.3 Loss of topsoil

Poor topsoil management during construction, with related soil profile disturbance (excavations etc.), may result in a decrease of the soil's agricultural suitability.

If mitigating measures are applied, the loss would be kept to the minimum.

7.2.4 Placement of spoil material during construction

Excavation material not properly managed during construction may render adjacent agricultural land unsuitable for future use. The mechanised drill-planting of PV panel supports eliminate foundation excavations with only trenches for cabling to be excavated, which would be refilled with the excess material.

7.2.5 Generation of alternative farm income

This is a positive impact of the development on the financial sustainability of farmers. With the financial benefit from the lease of the property, fodder can be bought from irrigation farmers at Gariep.

Loss of grazing land to the PV facility can therefore be recouped with a more intensive farming practise, subsidised by the PV facility.

7.3 MITIGATION MEASURES

When draining the PV fields, the aim is to spread run-off water instead of collecting it. This is done by constructing a corrugated surface. The construction can be done with normal farming machinery or special build equipment such as an Imprinter.

The roughness of the surface slows down water speed for better infiltration as well as wind speed for control of wind erosion.

7.4 IMPACT ASSESSMENT

Overall the impacts associated with the proposed activity have been rated as low with mitigation.

Table 5: Agricultural Impact Assessment (Lubbe, 2016)

Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Level of significance	Significance after mitigation
Loss of agricultural land	Development site	Long term	Low	Highly probable	Low	Low
Land surface disturbance, changing run-off characteristics and increasing erosion risks	Development site	Short term	Low	Highly probable	Low	Low
Loss of topsoil	Site and its immediate surroundings	Short term	Low	Improbable	Low	Low
Placement of spoil material during construction.	Site and its immediate surroundings	Short term	Low	Improbable	Low	Low
Generation of alternative farm income	Development site	Long term	Low	Improbable	Low	Low

Both proposed Alternatives have the same significance ratings and as such the preferred Alternative can be considered for authorisation.

8 ECOLOGICAL IMPACT ASSESSMENT

A specialist Ecological Impact Assessment was undertaken by Mr Simon Todd of Simon Todd Consulting. The full report is included as **Annexure E2** of this report.

The sensitivity map for the proposed development area of the Humansrus Solar 3 PV Facility site is illustrated below in Figure 31. There are no highly sensitive features identified within the site that would be affected by the development. The site is homogenous and there are no rocky hills or large drainage systems of higher sensitivity status. There are not many trees on the site, which suggests that it is unlikely that the development will impact more than a handful of any protected trees species. There are some areas of exposed gravels within the site and these may contain species of conservation concern such as *Lithops* or *Titanopsis* but these were not observed in the area during the site visit and it is not likely that these are present in the affected area as they are usually restricted to the hills in the area in the case of the *Lithops* and to areas of exposed calcrete in the case of the *Titanopsis*.

There are no areas of specific importance identified for terrestrial fauna or avifauna within the study area as it is generally homogenous. There are some drainage features along the southern boundary of the study area, but there are largely outside of the development footprint and would not be significantly affected. .

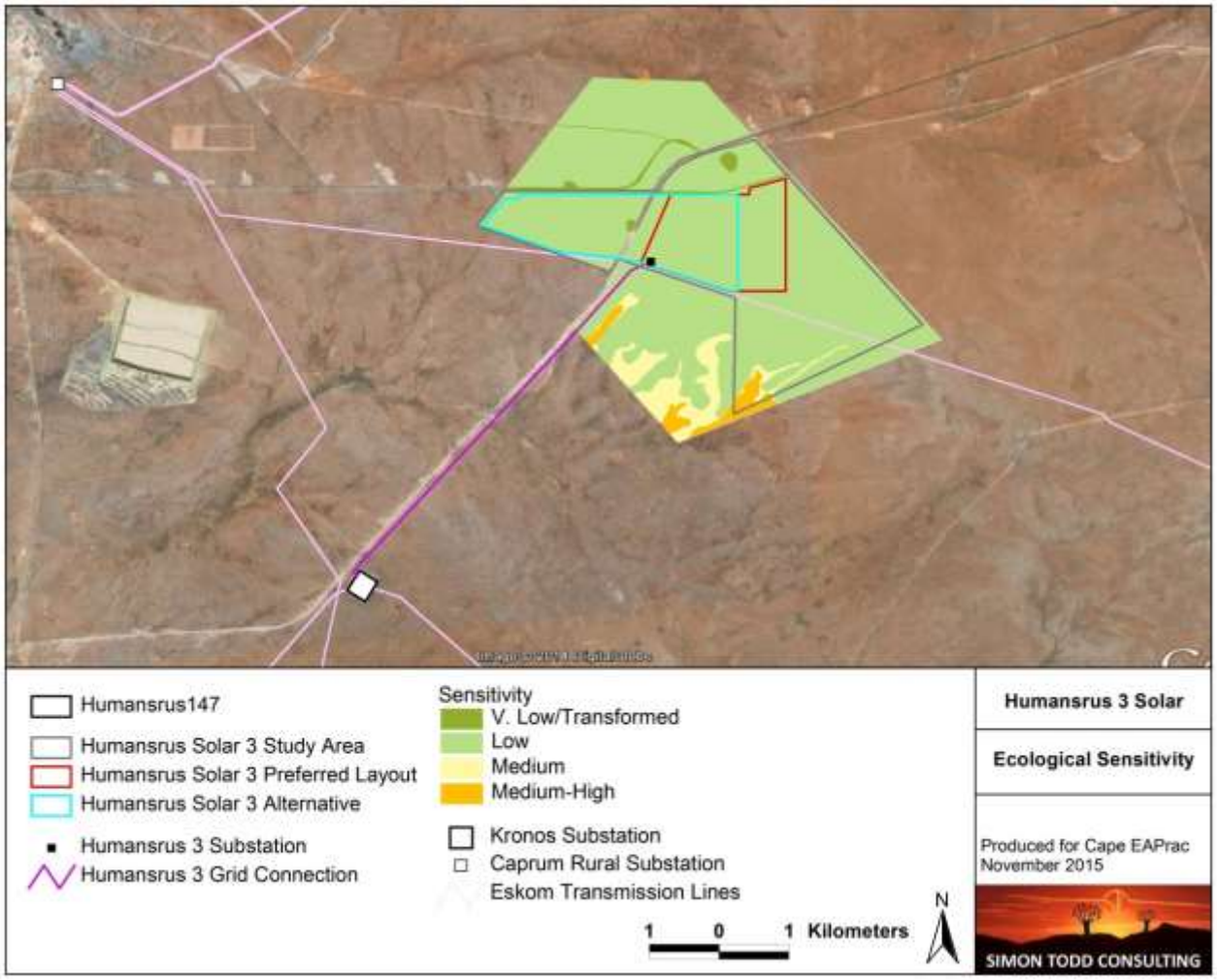


Figure 31: Ecological sensitivity map of the Humansrus Solar 3 PV Facility site

8.1 IDENTIFICATION & NATURE OF IMPACTS

In this section, the potential impacts and associated risk factors that may be generated by the development are identified. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the development are listed. The relevance and applicability of each potential impact to the current situation are then examined in more detail in the next section.

8.1.1 Identification of Potential Impacts and Damaging Activities

Potential ecological impacts resulting from the development of the Humansrus Solar 3 PV Facility would stem from a variety of different activities and risk factors associated with the preconstruction, construction and operational phases of the project including the following:

- Preconstruction Phase
    - Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose.
    - Site clearing & exploration activities for site establishment would have a negative impact on biodiversity if this was not conducted in a sensitive manner.
- Construction Phase

- Vegetation clearing for the reflector field, access roads, site fencing etc could impact listed plant species as well as high-biodiversity plant communities. Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.
- Increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may impact downstream riparian and wetland habitats if a lot of silt enters the drainage systems.
- Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.
- Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.

- Operational Phase
    - The operation of the facility will generate noise and disturbance which may deter some fauna from the area.
    - The areas inside the facility will requirement management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.
    - The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution with power line infrastructure.
- Cumulative Impacts
    - The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's ability to meet its conservation targets.
    - Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

8.2 IDENTIFICATION OF IMPACTS ASSESSED IN THE EIA PHASE

In this section each of the potential impacts identified above is explored in more detail with reference to the features and characteristics of the site and the likelihood that each impact would occur given the characteristics of the site and the extent and nature of the development.

- Impacts on vegetation and protected plant species

  Although their density would be low, there may be some protected species within the site that would be impacted by the development. Vegetation clearing during construction will lead to the loss of currently intact habitat within the development footprint and is an unavoidable consequence of the development. As this impact is certain to occur it will be assessed for the construction phase of the facility.

- Soil erosion and associated degradation of ecosystems

  The large amount of disturbance created during construction would potentially leave the site vulnerable to soil erosion, from both wind and water. Vegetation clearing, the panel arrays and access roads will all result in increased levels of runoff which will need to be managed and which would pose an erosion risk. Soil erosion is therefore considered a likely potential impact and will be assessed for the construction phase and operational phase.

- Direct faunal impacts

  Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some impact on fauna is highly likely to occur during construction as well as operation and this impact will therefore be assessed for the construction phase and operational phase.

- Impacts on Avifauna

  The development will result in habitat loss for resident species and the associated grid connection will potentially pose a long-term threat to avifauna. There are several listed species present in the area and bustards have been observed to be common at the site and some impact on these species therefore highly likely to occur. As an impact on avifauna is likely, it will be assessed for the construction and operational phase of the development.

- Alien Plant Invasion

  The disturbance created during construction is highly likely to encourage the invasion of the disturbed areas by alien species. Although there were not a lot of alien species present in the area, problem species such as *Prosopis* are present in the area and it is possible that species will colonise the disturbed areas if given the opportunity. This impact is deemed highly likely to occur and will be assessed as a likely impact associated with the development.

- Reduced ability to meet conservation obligations & targets

  The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets. The receiving vegetation types in the study area are classified as Least Threatened and are still more than 99% intact. As these are some of the most widespread and extensive vegetation types and there is no indication that there are any rare or restricted habitats within the development footprint, this is not likely to be a significant impact and will not be assessed unless the site visit suggests that this may be a potential problem.

- Impact on broad-scale ecological processes

  Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. Due to the presence of a number of other renewable energy developments in the area, this is a potential cumulative impact of the development that will be assessed during the EIA.

8.3 IMPACT ASSESSMENT

The following assessed impacts are those for the solar facility itself, for the planning and construction and operational phases of the development. Although there are two development options, these are not considered significantly different from one another in terms of their likely

impacts and so both are considered in a single assessment and they are not compared to one another.

8.3.1 Planning & Construction Phase

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Impacts on vegetation and listed or protected plant species resulting from construction activities	Local	Long-Term	High	Definite	Low	Medium Negative	Medium-Low Negative	High
Mitigation/Management Actions • Preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions. • Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • Eco to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas. • Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.								
Direct Faunal Impacts During Construction	Local	Short- Term	Medium	High	High	Medium Negative	Medium-Low Negative	High
Mitigation/Management Actions • All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition. • Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • If trenches need to be dug for water pipelines or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.								
Soil Erosion Risk During Construction	Local	Medium-term	Medium-High	High	Low	Medium-Low Negative	Low Negative	High

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Mitigation/Management Actions • Dust suppression and erosion management should be an integrated component of the construction approach. • Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas. • Regular monitoring for erosion problems along the access roads and other cleared areas. • Erosion problems should be rectified on a regular basis. • Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season. • A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.								

8.3.2 Operational Phase

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Alien Plant Invasion Risk During Operation	Local	Long-term	Medium-High	High	Low	Medium Negative	Low Negative	High
Mitigation/Management Actions • Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. • The recovery of the indigenous vegetation should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. • Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. • Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.								
Soil Erosion Risk During Operation	Local	Long-term	Medium-High	High	Low	Medium Negative	Low Negative	High
Mitigation/Management Actions • All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.								

- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.

Faunal impacts during operation:	Low	Long-term	Medium	Moderate	High	Medium-Low Negative	Low-Negative	High

Mitigation/Management Actions

- No unauthorized persons should be allowed onto the site.
- Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- If the facility is to be fenced, then the electrified strands should be on the inside of the fence as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour by retreating into their shells and are killed by repeated shocks.

8.3.3 Cumulative Impacts

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Impact on broad-scale ecological processes due to cumulative loss and fragmentation of habitat	Regional	Long-Term	Medium	Moderate	Low	Medium-Low Negative	Low Negative	Moderate-High

Mitigation/Management Actions

- Minimise the development footprint as far as possible and allow the retention of some natural vegetation between the rows of panels or trackers.
- The facility should be fenced off in a manner which allows fauna to pass by the facility as easily as possible. This implies not fencing-in large areas of intact vegetation into the facility and only the developed area should be fenced.

In summary, the Humansrus Solar 3 PV Facility site consists of low open shrubland with few species of conservation concern present. There are no features of high sensitivity within the site and it is considered low-moderate sensitivity. The abundance of fauna and flora of conservation concern at the site is low and the affected habitat types are widely available in the area and would not be significantly impacted by the current development or on a cumulative basis from the wider area. As a result, the impacts associated with the development of the Humansrus Solar 3 PV Facility site would be local in nature and not of high significance after mitigation.

The major impacts associated with the development of the Humansrus Solar 3 PV Facility would be **local habitat loss** and the **disruption of landscape connectivity**. As there are a number of other approved and proposed renewable energy projects in the area, the potential for **cumulative impacts is high.** However, the total extent of habitat loss in the area to date is less than 500ha and this is **not considered highly significant in context of the surrounding landscape** which is still largely intact. In addition, it is **not likely that the affected area is high significant for faunal movement or migration.**

There are no impacts associated with the development that cannot be mitigated to a low level and as a result, the site is considered to be a favourable location for the development. A summary assessment of the different impacts associated with the development is provided below and indicates that the largest proportion of impact associated with the development would occur at the construction stage, due the disturbance of fauna and loss or transformation of vegetation that will occur at this stage.

Table 6: Summary of ecological impacts (Todd, 2016)

Phase & Impact	Without Mitigation	With Mitigation
Planning & Construction		
Impacts on vegetation and listed or protected plant species resulting from construction activities	Medium Negative	Medium-Low Negative
Direct Faunal Impacts During Construction	Medium Negative	Medium-Low Negative
Soil Erosion Risk During Construction	Medium-Low Negative	Low Negative
Operation		
Alien Plant Invasion Risk During Operation	Medium Negative	Low Negative
Soil Erosion Risk During Operation	Medium Negative	Low Negative
Faunal impacts during operation:	Medium-Low Negative	Low-Negative
Cumulative Impacts		
Impact on broad-scale ecological processes due to cumulative loss and fragmentation of habitat	Medium-Low Negative	Low Negative

The impacts associated with the development apply to both proposed alternatives. There is a slight preference for the preferred alternative, Alternative 1 as it completely avoids the burrow pits identified on site.

9 AVIFAUNAL IMPACT ASSESSMENT

A specialist Avifaunal Impact Assessment was undertaken by Mr Blair Zoghby of Simon Todd Consulting. The full report is included as **Annexure E3** of this report.

While broad-scale vegetation patterns influence the distribution and abundance of bird species holistically, it is the fine-scale vegetation patterns and various avian microhabitats in an area that determine local avifauna populations.

Only two distinctly different avian microhabitats were identified at the site and these formed the basis of the avian site sensitivity map. These units include:

- ***Ephemeral pans***: There are a number of ephemeral pans (which will only hold water after heavy rains) scattered around the study area. This habitat unit is important for numerous species, as it is the only reliable source of surface water in the area, but is specifically important for endemic and threatened waterbirds (Greater Flamingo *Phoenicopterus ruber* and South African *Shelduck Tadorna cana* respectively). Some of the features are man-made and have their origin as borrow pits, but due to their long-term presence at the site, they have become important avifaunal features and many species are likely to use these areas on a regular basis as part of their wider range which includes numerous isolated pans and other larger aquatic features such as the Orange River.
- ***Karoo grassland/shrubland:*** This habitat unit represents the majority of the vegetation in the study area (Bushmanland Arid Grassland and Bushmanland Basin Shrubland) and is largely made up of extensive plains of white grasses and low shrubs. Although this habitat unit does not support the highest diversity and abundance of species, it does support numerous species of conservation concern (Kori Bustard *Ardeotis kori*, Ludwig's Bustard *Neotis ludwigii* and Karoo Korhaan *Eupodotis vigorsii*) as well as endemic and near-endemic passerine species.

It should however be noted, that the study area has already been subject to varying degrees of disturbance and degradation caused by past and present land-use practises. Evidence of high stocking rates and grazing pressure is apparent. There is also a network of minor farm roads throughout.

Photo 7: Ephemereal pans (Zoghby, 2016)

Photo 8: Karoo shrubland (Zoghby, 2016)

The birds of greatest potential relevance and importance in terms of the possible impacts of the SEF and its associated power infrastructure are likely to be local populations of threatened or endemic passerines (Sclater's Lark *Spizocrys* sclateri, Karoo Long-billed Lark *Certhilauda subcoronata,* Large-billed Lark *Galerida magnirostris,* Ant-eating Chat *Myrmecocichla formicivora* and Sickle-winged Chat *Cercomela sinuate*), shy ground-nesting species (Burchell's Courser *Cursorius rufus* and Double-banded Courser *Rhinoptilus africanus*), resident or visiting large terrestrial birds (Kori Bustard, Ludwig's Bustard, Karoo Korhaan and Secretarybird *Sagittarius serpentarius*), resident or passing raptors (Lanner Falcon *Falco biarmicus* and Martial Eagle *Polemaetus bellicosus*) and transient waterbirds (Greater Flamingo).

During the site visit (22-24 February 2016) there was a noticeably high density of Kori Bustards present throughout the study area, possibly in response to a recent insect emergence. Otherwise, besides the high diversity and abundance of bird species present around the *Ephemeral pans* habitat unit (30% of the species recorded during the site visit), in general, bird diversity and abundance across the study area was relatively low.

On the basis of the observations recorded during the field visit, and in combination with already documented information on the avifauna of the study area, 11 priority species are considered central in this avifaunal impact study (Table 1). These are mostly threatened species which are known to occur, or could occur, in relatively high numbers in the study area and the broader impact zone of the development and which are likely to be, or could be, negatively affected by the SEF. Two species, Kori Bustard and Karoo Korhaan, were recorded within the study area.

Overall, the avifauna of the study area and the broader impact zone of the SEF is not considered unique and is typical of what occurs across large areas of the Nama Karoo Biome, which therefore suggests that the sensitivity of the site, from an avian perspective, will not be of any great significance.

9.1 AVIAN SITE SENSITIVITY

The avian site sensitivity map (Figure 32) was generated by integrating avian microhabitats present on site and avifaunal information collected during the site visit. It is important to delineate sensitive avian microhabitats within the study area in order to ensure the development does not have a long term negative impact on these habitats. Important avian microhabitats in the developable area play an integral role within the landscape, providing nesting, foraging and reproductive benefits to the local avifauna.

Two sections within the study area have been assessed as being of *Very High* avian sensitivity. These areas were associated with the *Ephemeral pans* habitat unit, where bird diversity and abundance was high. These are foci of avifaunal activity and as they are not common features in the landscape disturbed birds may have to travel a long way to find alternative sites. As such, disturbance to these areas should be reduced as much as possible and it is recommended that a 100m buffer for development is instituted around these features.

The remainder of the study area, despite the presence of high densities of a priority species (Kori Bustard), was assessed as being of *Medium* avian sensitivity. The vegetation in these areas is associated with the *Karoo grassland/shrubland* habitat unit which is fairly homogenous across the study area. This habitat unit lacks structural and composition variation and therefore does not support a high diversity or abundance of bird species.

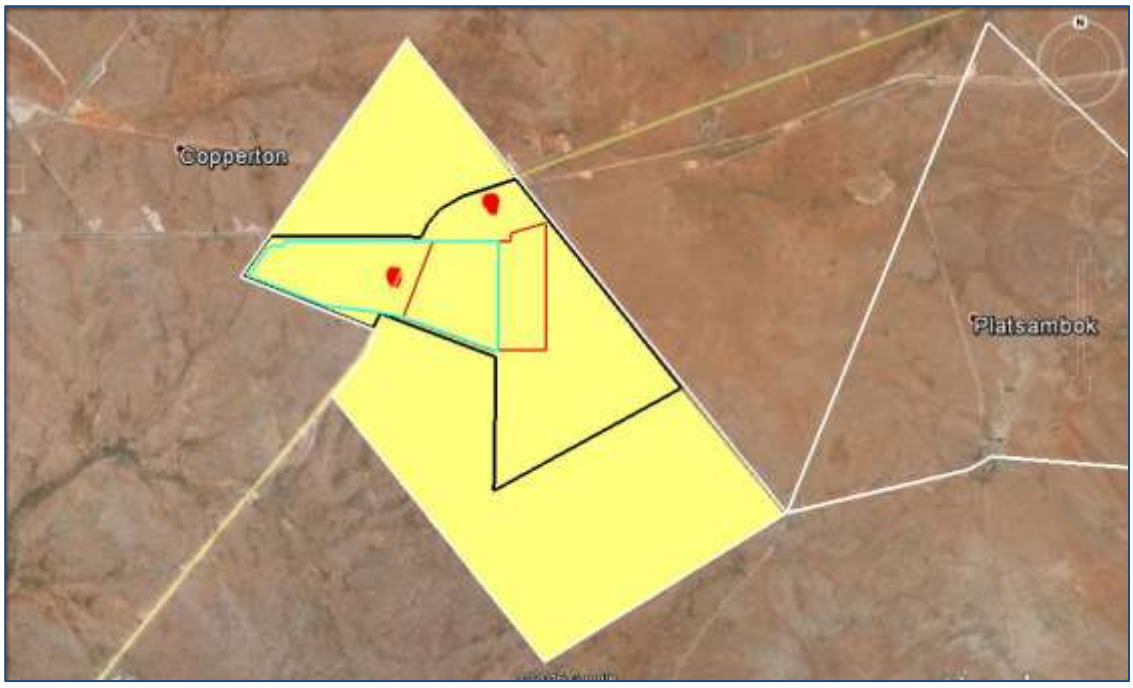


Figure 32: Avifauna sensitivity map (Zoghby, 2016)

9.2 IDENTIFICATION AND NATURE OF IMPACTS

9.2.1 Impacts of solar energy facilities

Habitat loss

Although the degree of this impact is dependent on the location and scale of the development, this is potentially the most significant impact associated with the construction and operation (maintenance) of SEFs. Extensive areas of vegetation (habitat) are cleared to accommodate the considerable amount of infrastructure required at these facilities, reducing the amount of habitat available to birds for foraging, roosting and breeding (Smallie, 2013). Given the considerable space requirements of commercially viable facilities (> 200 ha), this effect could be significant in some instances, particularly given the possibility that the initial footprint of successful facilities may be expanded over time, and allowing for the possible cumulative effects of multiple facilities in one area. This impact is likely to affect smaller bird species (i.e. larks and pipits) with small home ranges, as entire territories could be removed during construction activities.

Disturbance and displacement

Construction of SEFs requires a significant amount of machinery and labour to be present on site for a period of time. For shy, sensitive species or ground-nesting birds resident in the area, construction activities are likely to cause a temporary disturbance or even result in displacement from the site entirely. In addition, species commuting around the site may become disorientated by the reflected light and consequently fly longer distances to avoid the area, potentially resulting in displacement and energy implications (Smallie, 2013). Similarly, but to a lesser extent, ongoing maintenance activities at the operational facility are likely to cause some degree of disturbance to birds in the general vicinity.

Mortality

Bird mortality has been shown to occur due to direct collisions with solar panels. Species affected include waterbirds, small raptors, doves, sparrows and warblers (Kagan et al., 2014). The reflective surfaces of PV panels may confuse approaching birds and in some cases act as an attractant, being mistaken for large water bodies, resulting in injuries and/or mortalities when birds attempt to land on the installations.

Human conflict

Certain bird species may seek to benefit from the installations, using the erected structures as prominent perches, sheltered roost sites or even nesting sites, and possibly foraging around the infrastructure in response to changes in the distribution of preferred foods (i.e. plants growing under the panelling and other animals attracted to the facility). This may result in the fouling of critical components in the solar array, bringing local bird populations into conflict with facility operators.

9.2.2 Impacts of associated power infrastructure

Collisions with power infrastructure

Power lines pose a significant collision risk to birds, affecting a particular suite of collision prone species. These are mostly heavy-bodied birds such as bustards, cranes, storks, large eagles and various species of waterbirds that have limited manoeuvrability in flight, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (Anderson, 2001; van Rooyen 2004a; Jenkins *et al.,* 2010).

Electrocutions on power line and power infrastructure

Avian electrocutions occur when a bird perches or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the gap between live components and/or live and earthed components (van Rooyen, 2004b; Lehman *et al.,* 2007). Electrocution risk is strongly influenced by the power line voltage and the design of the pole structure and mainly affects larger, perching species such as vultures, eagles and storks that are capable of spanning the spaces between energised components.

Habitat destruction and disturbance associated with the construction and maintenance of power lines, substations and service roads

During the construction phase and maintenance of power lines, substations and service roads, some habitat destruction and alteration inevitably takes place. These activities have an impact on birds breeding, foraging and roosting in close proximity to the servitude through the modification of habitats and disturbance, particularly during breeding activities.

9.3 PROJECT SPECIFIC ASSESSMENT OF IMPACTS

Specific impacts of the proposed Humansrus Solar 3 PV Facility are most likely to be manifested in the following ways:

- **Disturbance and displacement of local threatened or endemic passerines** – Sclater's Lark, Karoo Long-billed Lark, Large-billed Lark and Ant-eating Chat – and shy ground-nesting species – Burchell's Courser and Double-banded Courser – from nesting and/or foraging areas by construction and/or operation and/or decommissioning of the SEF.
- **Disturbance and displacement of resident or visiting large terrestrial species** – Kori Bustard, Ludwig's Bustard, Karoo Korhaan and Secretarybird – from nesting and/or foraging areas by construction and/or operation and/or decommissioning of the SEF, and/or mortality of these species in collisions with new power lines whilst flying *en route* to distant resource areas.
- **Disturbance and displacement of resident or visiting raptors** – Lanner Falcon and Martial Eagle – from foraging areas by construction and/or operation and/or decommissioning of the SEF, and/or mortality of these species in collisions with new power lines or by electrocutions when perched on power infrastructure.

- **Injury or mortality of waterbirds birds** – Greater Flamingo – using possible flight paths in and out of resource areas in the broader impact zone of the SEF in collisions with solar panels and/or new power lines.

Generally, however, the anticipated impacts on avifauna of the proposed development are **not considered to be of any great significance if mitigation measures are applied**. There will be some habitat loss for endemic passerines, some species – endemic passerines, large terrestrial species and raptors – may be displaced from a broader area either temporarily by construction and maintenance activities, or more permanently by the disruptive, reflective properties of the solar panels and ongoing activities at the operational development, and some species (large terrestrials, raptors and transient waterbirds birds) may be killed in interactions (collisions and electrocutions) with the new power lines and power infrastructure, but numbers affected are likely to be low.

9.4 IMPACT ASSESSMENT

9.4.1 Construction phase impacts

Habitat loss due to construction

Nature

All construction activities would result in a loss of vegetation and habitat affecting endemic passerines, large terrestrial species and raptors through site clearance for solar panels, the construction of internal roads and the establishment of auxiliary buildings.

The habitat is however already degraded to varying degrees across the developable area and the habitat is not unique within the landscape.

All priority species could potentially be affected by this impact.

	Without mitigation		With mitigation	
	Preferred site layout	Alternative site layout	Preferred site layout	Alternative site layout
Extent	Low	Low	Low	Low
Duration	Long-term	Long-term	Long-term	Long-term
Magnitude	Low	Moderate	Minor	Low
Probability	Definite	Definite	Definite	Definite
Significance	Medium	High	Medium	Medium
Status	Negative			
Reversibility	Low (habitat will be lost during construction)			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Partially, due to the space requirements, some land and avian microhabitats will be impacted.			

Mitigation

- All construction activities must be carried out according to the generally accepted environmental best practise and the temporal and spatial footprint of the development should be kept to a minimum.
- Care must be taken in the vicinity of sensitive microhabitats such as the *Ephemeral pans* habitat unit.
- Existing roads must be used as much as possible for access during construction.

- The boundaries of the development area are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint.
- Provide adequate briefing for site personnel.
- Any bird nests that are found during the construction phase must be reported to the Environmental Control Officer (ECO).
- The above measures must be covered in a site specific EMPr and controlled by an ECO.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the loss of natural habitat within the area.

Residual impacts

Moderate. The vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place.

Disturbance during construction

Nature

All construction activities would result in a disturbance impact affecting endemic passerines, large terrestrial species, raptors and waterbirds through the noise and movement of construction equipment and personnel.

It must however be noted, that species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during the construction phase.

All priority species could potentially be affected by this impact.

	Without mitigation		**With mitigation**	
	Preferred site layout	**Alternative site layout**	**Preferred site layout**	**Alternative site layout**
Extent	Low	Low	Low	Low
Duration	Short-term	Short-term	Short-term	Short-term
Magnitude	Low	Moderate	Minor	Low
Probability	Highly Probable	Highly Probable	Probable	Probable
Significance	**Low**	**Medium**	**Low**	**Low**
Status	Negative			
Reversibility	Low (species will be disturbed)			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Partially			

Mitigation

- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any priority species identified in this report are observed to be roosting and/or nesting and breeding in the vicinity, the ECO must be notified.
- The construction camps and laydown areas and site offices etc. must be as close to the

site as possible.

- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all internal roads.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the disturbance of avifauna within the area.

Residual impacts

Moderate. Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development.

9.4.2 Operational phase impacts

Disturbance during operation

Nature

All maintenance and operational activities would result in a disturbance impact affecting endemic passerines, large terrestrial species, raptors and waterbirds through the noise and movement of maintenance equipment and personnel.

All priority species could potentially be affected by this impact.

	Without mitigation		**With mitigation**	
	Preferred site layout	**Alternative site layout**	**Preferred site layout**	**Alternative site layout**
Extent	Low	Low	Low	Low
Duration	Long-term	Long-term	Long-term	Long-term
Magnitude	Low	Low	Minor	Minor
Probability	Highly Probable	Highly Probable	Probable	Probable
Significance	**Medium**	**Medium**	**Low**	**Low**
Status	Negative			
Reversibility	Low (species will be disturbed)			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Partially			

Mitigation

- If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling of panels or other problems, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed to fledge their chicks before nests are removed.
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.

- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all access roads.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the disturbance of avifauna within the area.

Residual impacts

Moderate. Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development.

Collisions with solar panels

Nature

The PV facility is comprised of reflective panelling occupying a large area. Avifauna can be disorientated by the reflected light and consequently be displaced from an area more extensive than just the development footprint.

Waterbirds have been known to mistake the reflective surface for an expanse of water and attempt to land on the panels, resulting in injuries and even death.

Large terrestrial species, raptors and waterbirds could potentially be affected by this impact.

	Without mitigation		**With mitigation**	
	Preferred site layout	**Alternative site layout**	**Preferred site layout**	**Alternative site layout**
Extent	Low	Low	Low	Low
Duration	Long-term	Long-term	Long-term	Long-term
Magnitude	Low	Low	Minor	Minor
Probability	Improbable	Improbable	Improbable	Improbable
Significance	**Low**	**Low**	**Low**	**Low**
Status	Negative			
Reversibility	Low (birds may be injured or killed)			
Irreplaceable loss of resources	Yes			
Can impacts be mitigated	No			

Mitigation

- Monitor all avifaunal incidents or mortalities observed within the facility (recorded and documented with photographs to ensure correct identification).
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the area being covered by solar panels thus increasing the probability of

collisions.

Residual impacts

None. Once the solar panels are decommissioned the injuries and mortalities will cease.

9.4.3 Grid connection - construction phase impacts

Habitat loss due to power line construction

Nature

All construction activities would result in a loss of vegetation and habitat affecting endemic passerines, large terrestrial species, raptors and waterbirds through site clearance for substations and power line infrastructure and servitudes which have to be cleared of excess vegetation at regular intervals in order to allow access to power lines for maintenance and to prevent vegetation from intruding into the legally prescribed clearance gap, minimising the risk of fire.

The habitat is however already degraded to varying degrees across the developable area and the habitat is not unique within the landscape.

All priority species could potentially be affected by this impact.

	Without mitigation	With mitigation
Extent	Low	Low
Duration	Long-term	Long-term
Magnitude	Minor	Minor
Probability	Definite	Definite
Significance	**Medium**	**Medium**
Status (positive or negative)	Negative	
Reversibility	Low (habitat will be lost during construction) and cannot easily be recovered after the development ceases.	
Irreplaceable loss of resources?	No	
Can impacted be mitigated?	Partially, due to the space requirements, some land and avian microhabitat will be impacted.	

Mitigation

- All construction activities must be carried out according to the generally accepted environmental best practise and the temporal and spatial footprint of the development should be kept to a minimum.
- Care must be taken in the vicinity of sensitive microhabitats such as the *Ephemeral pans* habitat unit.
- Existing roads must be used as much as possible for access during construction.
- The boundaries of the development area are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint.
- Provide adequate briefing for site personnel.

- Any bird nests that are found during the construction phase must be reported to the Environmental Control Officer (ECO).
- The above measures must be covered in a site specific EMPr and controlled by an ECO.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the loss of natural habitat within the area.

Residual impacts

Moderate. The vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place.

Avifaunal disturbance due to grid connection construction activities

All construction activities would result in a disturbance impact affecting endemic passerines, large terrestrial species, raptors and waterbirds through the noise and movement of construction equipment and personnel.

It must however be noted, that species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational phases.

All priority species could potentially be affected by this impact.

	Without mitigation	**With mitigation**
Extent	Low	Low
Duration	Short-term	Short-term
Magnitude	Low	Minor
Probability	Highly Probable	Probable
Significance	**Low**	**Low**
Status (positive or negative)	Negative	
Reversibility	Low (species will be disturbed during construction, but disturbance during operational will be lower along the power line.)	
Irreplaceable loss of resources?	No	
Can impacted be mitigated?	Partially	

Mitigation

- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any priority species identified in this report are observed to be roosting and/or nesting and breeding in the vicinity, the ECO must be notified.
- The construction camps and laydown areas and site offices etc. must be as close to

the site as possible.

- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all internal roads.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the disturbance of avifauna within the area.

Residual impacts

Moderate. Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development.

9.4.4 Grid connection - operational phase impacts

Disturbance along power line

All maintenance and operational activities would result in a disturbance impact affecting endemic passerines, large terrestrial species, raptors and waterbirds through the noise and movement of maintenance equipment and personnel.

All priority species could potentially be affected by this impact.

	Without mitigation	**With mitigation**
Extent	Low	Low
Duration	Short-term	Short-term
Magnitude	Low	Minor
Probability	Highly Probable	Probable
Significance	**Low**	**Low**
Status (positive or negative)	Negative	
Reversibility	High (species will be disturbed while there is activity along the line, but disturbance will be low at other times and the there will not be a long-term impact after decommissioning.	
Irreplaceable loss of resources?	No	
Can impacted be mitigated?	Partially	

Mitigation

- If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling or panels or other problem, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already

with eggs and chicks should be allowed to fledge their chicks before nests are removed.

- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.
- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all access roads.

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the disturbance of avifauna within the area.

Residual risks

Moderate. Some disturbance during the operational phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development.

Avian electrocutions on power infrastructure

Electrocutions of birds on associated power infrastructure results in injuries or death and could potentially affect large, perching species in the area such as raptors and storks.

Avian electrocutions occur when a bird perches or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the gap between live components and/or live and earthed components (van Rooyen, 2004b; Lehman *et al.,* 2007).

Of the priority species, Martial Eagle and, to a lesser extent, Verreaux's Eagle could potentially be affected by this impact.

	Without mitigation	**With mitigation**
Extent	Low	Low
Duration	Long-term	Long-term
Magnitude	Minor	Minor
Probability	Highly Probable	Probable
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	
Reversibility	Low (birds will be injured or killed while the power line is present and the impact will only be removed when the lines are decommissioned.	
Irreplaceable loss of resources?	Yes	
Can impacted be mitigated?	Yes	

Mitigation

- A “Bird Friendly” structure, with a bird perch (as per standard Eskom guidelines) should be used for the tower infrastructure.
- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting, 2002).
- Installation of artificial bird space perches and nesting platforms, at a safe distance from energised components (Goudie, 2006; Prinsen *et al*., 2012).

Cumulative impacts

Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the length of power infrastructure in the area and therefore the subsequent risk.

Residual impacts

Moderate. The power line infrastructure will be within the area over a long period of time, if not permanently. However, if the power line infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

Avian collisions with power lines

Collisions are the single biggest threat posed by power lines in South Africa (van Rooyen, 2004). Avian species most susceptible and impacted upon are large, heavy-bodied birds such as bustards, storks, korhaans and certain raptors.

All priority species could potentially be affected by this impact, but specifically, Kori Bustard, Karoo Korhaan, Secretarybird, Martial Eagle and Greater Flamingo.

	Without mitigation	With mitigation
Extent	Low	Low
Duration	Long-term	Long-term
Magnitude	Low	Minor
Probability	Highly Probable	Probable
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	
Reversibility	Low (birds will be injured or killed and the impact will likely persist for the lifetime of the line and will only be reversed when it is removed)	
Irreplaceable loss of resources?	No	
Can impacted be mitigated?	Yes	

Mitigation

- High sensitivity sections of the power line should be marked with Bird Flight Diverters (BFDs), on the earth wire of the line, 5 metres apart, alternating black and white to

increase the visibility of the power line and reduce the likelihood of collisions. • The power line route should be scanned at least twice a month for the first year after construction to identify and locations of high impact. All mortalities along the power line route should be recorded and if there are any sites where repeated mortalities have occurred, an avifaunal specialist should be consulted for advice on additional mitigation measures to be implemented.
Cumulative impacts Moderate. The development borders the proposed Humansrus 4 Solar PV Facility which will also contribute to the length of power infrastructure in the area and therefore the subsequent risk.
Residual impacts Moderate. The power line infrastructure will be within the area over a long period of time, if not permanently. However, if the power line infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

Preferred site layout (Alternative 1)

The preferred site layout (Alternative 1) falls entirely within a *Medium* sensitivity area, associated with the *Karoo grassland/shrubland* habitat unit. This layout option avoids the *Very High* sensitivity *Ephemeral pans* and is smaller in extent (216 ha) than the alternative site layout (285 ha). Bird species diversity and abundance was relatively low and as such, in terms of the potential impacts to avifauna, is considered to have acceptable levels of impact. The preferred site layout is therefore recommended for the Humansrus Solar 3 PV Facility development.

Alternative site layout

The alternative site layout encompasses a *Very High* sensitivity area, associated with the *Ephemeral pans* habitat unit. Bird species diversity and abundance was high in this habitat unit and as such, any development in this area would have a medium impact to avifauna. The preferred site layout option is therefore recommended over the alternative site layout option for the Humansrus Solar 3 PV Facility development.

10 AQUATIC IMPACT ASSESSMENT

The specialist Aquatic Delineation & Impact Assessment was undertaken by Mr Brian Colloty of Scherman Colloty & Associates. The full report is included as **Annexure E4** of this report.

The water body delineation and classification was conducted using the standards and guidelines produced by the DWA (DWAF, 2005 & 2007) and the South African National Biodiversity Institute (SANBI, 2009). These methods are contained in the attached Aquatic Delineation and Impact Statement included as Annexure E4, which also includes wetland definitions, wetland conservation importance and Present Ecological State (PES) assessment methods used in this report. Reference is also included with regard to relevant legislation related to the protection of waterbodies and the minimum requirements in terms of prescribed buffers.

The National Freshwater Ecosystems Priority Area (NFEPA) wetland data, indicated that several natural waterbodies could occur within the study area, some being artificial or man-made systems are also shown in Figure 33. This was confirmed during the site visit. However, no natural wetlands were found in close proximity to the site, and only dams and or borrow-pits were observed (Photo 9).

Photo 9: Borrow pit identified as an artificial wetland (Colloty, 2016)

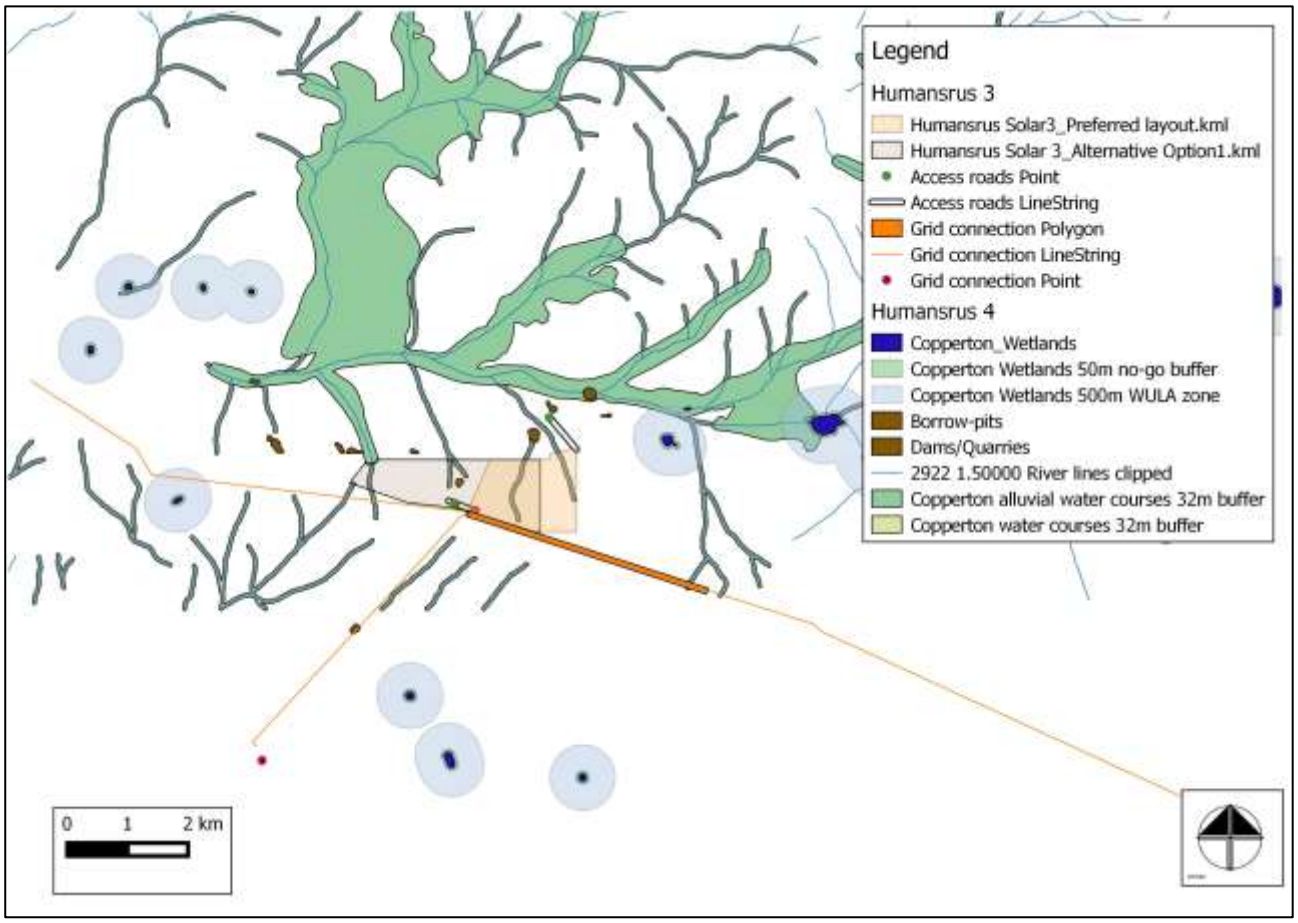


Figure 33: Main watercourses and potential wetlands with recommended buffers according to the National Wetland Inventory (Colloty, 2016)

Figure 33 thus indicates that no portions of the project are located within 500 m of a wetland boundary, and only water course crossings will be required.

10.1 PRESENT ECOLOGICAL STATE AND CONSERVATION IMPORTANCE

The Present Ecological State (PES)

The Present Ecological State of a waterbody represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habitat and biota, as well as ecosystem functioning (Category E).

The national Present Ecological Score or PES scores have been revised for the country and is based on new models that incorporate aspects of functional importance as well as direct and indirect impacts. The new PES system also incorporates EI (Ecological Importance) and ES (Ecological Sensitivity) separately as opposed to EIS (Ecological Importance and Sensitivity) in the old model. Although the new model is still heavily centered on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above mentioned parameters is assessed or the overall PES is rated between a C or D.

Previously it was stated in this report that the PES scores for the respective catchments (i.e. main stem water courses) as per the 1999 data were B or largely Natural. Based then on the latest model and information collected during the site visit, these remained unchanged and would also apply to all the smaller systems within the study area. This is due to the fact that the impacts are similar to those listed previously and no additional degradation to the landscape has occurred since 1999.

With regard to this study, the wetlands i.e. pans, would also be considered Largely Natural (**PES = B)**.

The EI and ES for these systems will be rated as **Low**. This would apply to both the riverine and remaining wetland area observed in this study. The overall EI and ES scores for all the systems within the site could have been higher, but scores were reduced due to the presence of tracks and grazing.

10.2 POTENTIAL IMPACTS AND RISK ASSESSMENT

During the impact assessment study a number of potential key issues / impacts were identified. Two main issues are highlighted and these are listed below, together with related impacts that have the potential to arise should the project go-ahead.

Issue – Biological environment (e.g. vegetation)

- Impact 1: Loss of riparian systems

Issue - Physical environment

- Impact 2: Impact on dry riverbeds and localised drainage systems (road crossings)
- Impact 3: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function (hydrological changes)
- Impact 4: Increase in sedimentation and erosion
- Impact 5: Physical disturbance by the supporting infrastructure (e.g. transmission lines) on the riverine environment.

10.3 AQUATIC IMPACT ASSESSMENT

The impacts were assessed as follows, noting that these would be similar for all the alternatives as the proposed footprint areas could avoid all major water courses, while utilising the same or similar main access road and transmission line routes:

Nature: Impact 1 - Loss of riparian systems

The physical removal of the narrow strips of woody riparian zones. This biological impact would however be localised within the dry river beds and small drainage lines within each of the road crossings only while a large portion of the remaining farms and the mainstem systems will remain intact.

	Without mitigation	**With mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Low	Low
Probability	Probable	Improbable
Significance	**Low**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

Mitigation:

The proposed layout should be developed to avoid as many of the smaller drainage lines as possible.

Where crossings do occur, designs will ensure that flow are not disrupted and that erosion protection is placed appropriately

Cumulative impacts:

None

Residual impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development site.

Nature: Impact 2 - Impact on dry riverbeds and localised drainage systems

The physical removal of narrow strips of woody riparian zones and the clearing of natural vegetation could alter the hydrological nature of the area, by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. This impact would however be localised (road crossings and panel arrays), as a large portion of the remaining farm and the catchment would remain intact. As in Impact 1, only a small number of the narrower drainage lines should be impacted on directly at road crossings and or the

development taking place within areas of Low Sensitivity.		
	Without mitigation	**With mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Low	Low
Probability	Definite	Probable
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: Any stormwater within the site must be handled in a suitable manner to capture large volumes of run-off, trap sediments and reduce flow velocities.		
Cumulative impacts: The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the site is near the main drainage channels and the annual rainfall figures are low. When considering the other potential projects within the adjacent / nearby farms, the potential for changes to the surrounding hydrological habitat could be significant especially during the operational phases (hard surfaces and stormwater management). It is however assumed, together with the low mean annual run-off that with suitable stormwater management the impacts could however be mitigated, coupled to the fact that a low percentage of projects actually move into the construction phase.		
Residual impacts: Diversion of run-off away from downstream systems is unlikely to occur as the annual rainfall figures are low.		

Nature: Impact 3 - Impact on riparian systems through the possible increase in surface water runoff on riparian form and function		
	Without mitigation	**With mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Low	Low
Probability	Definite	Probable
Significance	**Medium**	**Low**
Status (positive or	Negative	Negative

negative)		
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

Mitigation:

Any stormwater within the site must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments, and reduce flow velocities (e.g. water used when washing the mirrors).

The project should also try capture and recycle any form of run-off created by the daily operations. This would minimise the amount of water required by the project, but also serve to limit the downstream impacts on the riparian systems through an increase in run-off, a situation that these systems are currently unaccustomed to.

Cumulative impacts:

Downstream alteration of hydrological regimes due to the increased run-off from the area. When considering the other potential projects within the adjacent / nearby farms within a 10-15 km radius, the potential for changes to the surrounding hydrological habitat could be significant especially during the operational phases (hard surfaces and stormwater management). It is however assumed that any such changes would be detrimental to the various projects owners (erode areas around infrastructure), thus together with the low mean annual run-off and suitable stormwater management, the impacts could be mitigated, coupled to the fact that a low percentage of projects actually move into the construction phase.

Residual impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development site but unlikely.

Nature: Impact 4 - Increase in sedimentation and erosion within the development footprint		
	Without mitigation	**With mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Low	Low
Probability	Definite	Probable
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No

Can impacts be mitigated	Yes	
Mitigation: Any stormwater within the site must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the mirrors).		
Cumulative impacts: Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream will then be washed into the Basterspt River. When considering the other potential projects within the adjacent / nearby farms the potential for changes to the surrounding hydrological habitat would not be significant especially during the operational phases (hard surfaces and stormwater management).		
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development site but unlikely.		

Nature: Impact 5 - Physical disturbance by the supporting infrastructure (roads & transmission lines) on the riparian environment

The proposed alignments will have limited to no (Transmission line) impact on the functioning of any riparian systems.

	Without mitigation	**With mitigation**
Extent	Local	Local
Duration	Long-term	Long-term
Magnitude	Moderate	Low
Probability	Definite	Probable
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

Mitigation:

The proposed layout has thus been developed to avoid the significant water courses and should avoid as many of the smaller drainage lines as possible. Care should however be taken that if any clearing is done, that this area is monitored for plant re-growth, firstly to prevent alien plant infestations and to ensure no erosion or scour takes place.

Cumulative impacts:
Additional downstream erosion and sedimentation of the downstream watercourses.
Residual impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development site but unlikely.

10.4 SUMMARY

The proposed layout for the solar energy facility will have a **negligible impact** on the aquatic environment. The project has adhered to past specialist recommendations and the infrastructure that would have posed even a slight risk to water resources has been moved outside of any direct wetlands or water course areas.

Furthermore, during the site visit, no aquatic protected or species of special concern (fauna & flora) were observed within the adjacent areas that will be used. Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be **LOW**.

Figure 33 further indicates various buffers as required by the legislation, for each type of aquatic feature, which would trigger the need for a Water Use License application, should any construction take place within these areas. The aquatic specialist has no objection to the authorisation for any of the supporting infrastructure such as road crossings within these areas.

This would apply to any of the proposed alternatives as they would present a similar impact on the aquatic environment.

Finally, when considering any other potential projects within the adjacent / nearby farms the potential for changes to the surrounding aquatic habitat would not be significant especially during the operational phases (hard surfaces and stormwater management). It is however assumed that any such changes would be detrimental to the various project's owners, i.e. erode areas around panels. This coupled to the fact that the low mean annual run-off and with suitable stormwater management the impacts could be mitigated. The likelihood of any cumulative impacts listed in this report is especially low when considering the only a low percentage of projects will actually move into the construction phase.

11 INTEGRATED HERITAGE IMPACT ASSESSMENT

11.1 CULTURAL LANDCAPE CHARACTER

A specialist Integrated Heritage Impact Assessment was undertaken by Mr Stefan de Kock of Perception Planning. The full report is included as **Annexure E5** of this report.

The term "cultural landscape" refers to the imprint created on a natural landscape through human habitation and cultivation over an extended period of time. While the Cape has been inhabited for many hundreds of thousands of years (pre-colonial history) prior to Western settlement (colonial history), the nomadic lifestyles of early inhabitants are not always as evident within the landscape as the significant imprints made by humans during the last two – three hundred years and more. Unlike ancient landscapes in parts of the world where environmental conditions allowed more intensive cultivation over periods much longer than locally and allowed natural and cultural components of the landscape to become interwoven, landscape components, the Northern Cape has not yet developed in such a manner. The fact that natural and cultural landscape components in the region are therefore more distinguished means that the cultural landscape is likely to be very vulnerable to the cumulative impact of inappropriate large-scale development.

Ultimately, definition of a cultural landscape can be informed by the following elements, weighed through professional opinion, public values and statutory (legal) framework:

- Natural Landscape
- Public Memory
- Social History
- Historical Architecture
- Palaeontology
- Archaeology

The site may be described as forming part of a typical Karoo landscape and defined by flat and wide open spaces overgrown by sparse, low-growing vegetation. From a Pre-Modern perspective, the site formed part of an area mostly used for small stock farming and so, modern man-made features noted on the site included e.g. shallow pans, fences, wind pumps and cement water reservoirs related to said land use. A decommissioned abandoned railway line and numerous powerlines also traverse the site - all of which have already altered the surrounding landscape from what may be perceived to have been a purely “rural” cultural landscape prior to these having been constructed many years ago.

West-facing views across the landscape are however dominated by spoil heaps from the former Copperton mine and further impacts of mining activities have materially and permanently altered the adjoining landscape. From a cultural landscape perspective, the site is therefore considered to be of no local cultural significance. No ruins or significant structures were noted on or within the direct proximity of the site.

11.2 ARCHAEOLOGY

An Archaeological Impact Assessment (AIA), compiled by ACO Associates, provides the findings of which are summarised below with permission from the authors. The full report is included as **Annexure E6** of this report.

The study area for Humansrus Solar 3 PV Facility and Humansrus Solar 4 PV Facility was surveyed by Lita Webley and David Halkett on 23 October 2014. The property was accessed by the local farm roads and transects were walked across the study area.

The field assessment identified:

- A diffuse spread of ESA and MSA stone artefacts across the study area for Humansrus Solar 3 PV Facility;
- There are no buildings or graveyards on the property;

Indications are that in terms of archaeological heritage the proposed activity is viable; impacts are expected to be limited and controllable. Construction of the proposed solar facility may proceed. **Either layout (Alternative 1 and Alternative 2) is acceptable.**

The following recommendations should be enforced:

- If during ground clearance or construction, any dense accumulations of stone tools, particularly if they are associated with ostrich eggshell fragments, are uncovered then the ECO should report this to SAHRA (Tel: 021 462 4502);
- The appropriate recommendations will need to be implemented during the EMP should unmarked graves be encountered during construction. If any human remains are uncovered during construction, the ECO should have the area fenced off and contact SAHRA (Tel: 021 462 4502) immediately.

11.2.1 Cumulative Impacts

Of concern, however, is the increasing number of renewable energy facilities in this area. The cumulative impacts of the developments will result in widespread destruction of pre-colonial sites. Although many of these sites have, individually, been rated as having low significance, the cumulative impact of the removal of all archaeological material will result in the destruction of large areas of archaeology and could be considered significant.

Limited mitigation, particularly of Later Stone Age sites, has been undertaken by Orton (2014) on the farm Klipgats Pan 117 and this addresses some of the concerns about the destruction of archaeological heritage. The mitigation of additional archaeological sites will need to be considered based on the merits of each site. Mitigation of archaeological sites on a portion of Humansrus 147 is not warranted based on the low significance of the archaeological resources on the property.

11.3 PALAEONTOLOGY

Below is an extract from recommended exemption report (Almond, 2016), which concluded that the proposed Humansrus Solar 3 PV Facility near Copperton, including the associated short 132 kV transmission line to the Kronos Substation and other infrastructure, is unlikely to have significant impacts on local palaeontological heritage resources. The full statement is included as **Annexure E7** of this report.

There is no preference on palaeontological heritage grounds for the preferred or alternative layout of the solar facility.

Given the generally low palaeontological sensitivity of the Copperton region (based on several recent field studies in the area), the cumulative impact of the proposed solar facility as well as several other local alternative energy developments is assessed as low.

It is therefore recommended that, pending the discovery of significant new fossils remains before or during construction, exemption from further specialist palaeontological studies and mitigation be granted for the proposed Humansrus Solar 3 PV Facility on a portion of the farm Humansrus 147 near Copperton.

Should any substantial fossil remains (e.g. well-preserved stromatolites, mammalian bones and teeth) be encountered during excavation, however, these should be safeguarded, preferably in situ, and reported by the ECO to SAHRA, i.e. The South African Heritage Resources Authority, as soon as possible (Contact SAHRA at P.O. Box 4637, Cape Town 8000 or Tel: 021 462 4502 so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

11.4 VISUAL

A specialist Visual Statement was undertaken by Mr Stephen Stead of VRMA. The full report is included as **Annexure E8** of this report.

The Visual Statement considers the anticipated visual impacts related to the proposal and assesses the implications of the possible site alternatives as transposed from said report below (with permission from author).

A broad-brush regional landscape survey was undertaken to identify key features that define the landscape context within the project approximate viewshed area. The following landmarks were identified as significant in defining the surrounding areas characteristic landscape:

- Copperton mine and tailing storage facility
- Eskom substation and powerlines

- Solar energy context
- R357 road
- Old railway line
- Isolated farmsteads

It is the findings of the visual report that **all of the alternatives are suitable for development** with mitigation. It was found that the proposed alternatives would not constitute a significant visual impact to the characteristic landscape for the following reasons:

- The proposed project's close proximity to the Copperton mine and TSF.
- The old railway line and borrow pits degrade the landscape in the immediate vicinity.
- The area is an unofficial node for Solar Energy development with adjacent sites already having authorization.
- The alignment of the proposed project with municipal planning.

Due to the flat terrain and the location of the southern extent of the proposed site on a shallow watershed, the visibility would extend cover most of the Foreground distance areas (up to 6km from site). However, the only receptor identified within the viewshed with high exposure was the R357, which is located adjacent to the proposed site.

To assist in reducing the massing and crowding effects of the proposed PV structures the following is recommended:

- That a 75m No-go buffer from the R357 and the Copperton roads be maintained.
- To reduce visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity, it is recommended that the power lines as much as possible follow existing transmission line corridors.
- Dust control measures should be implemented when required.
- Lights at night have the potential to significantly increase the visual exposure of the proposed project. It is recommended that mitigations be implemented to reduce light spillage (refer to Annexure 3 of the Visual Statement for general guidelines).

Due to the potential cluttering of the landscape from all the different power lines converging on the two local substations, the cumulative visual impact significance was rated high without mitigation. With mitigation and integrating planning of development corridors by DEA and Eskom, the cumulative impacts can be reduced to low.

11.5 HERITAGE INFORMANTS AND INDICATORS

11.5.1 Cultural landscape issues

From a regional and natural landscape perspective, the proposed development site forms part of a highly-transformed landscape altered through mining activities as well as high concentration of proposals for development of several renewable energy (solar) facilities.

While the proposal would relate to a landscape modification, we do not consider that it would alter any natural or cultural landscape of cultural significance.

11.5.2 Visual-spatial issues

Recommendations reflected in the Visual Statement, as summarised below shall be adhered to.

11.5.3 Archaeology

All recommendations contained in AIA, as summarised below shall be adhered to.

11.5.4 Palaeontology

It is recommended that no further paleontological studies or mitigation be undertaken in respect of the proposed development site. Should substantial fossil remains be exposed during construction, however, the ECO should safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

11.6 RECOMMENDATIONS

Table 7: HIA Recommendations (De Kock, 2016)

	Recommended Conditions of Approval
VS-1	*That a 75m No-go buffer from the R357 and Copperton roads be maintained.*
VS-2	*To reduce visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity, it is recommended that the power lines as much as possible follow existing transmission line corridors.*
VS-3	*The lay down should be located away from the main roads (as much as possible).*
VS-4	*Dust control measures should be implemented when required.*
VS-5	*Lights at night have the potential to significantly increase the visual exposure of the proposed project. It is recommended that mitigations be implemented to reduce light spillage (refer to Addendum for general guidelines).*
AIA-1	*Indications are that in terms of archaeological heritage the proposed activity is viable; impacts are expected to be limited and controllable.*
AIA-2	*Due to potential cumulative impacts in the area, some limited sampling of artefactual material should occur prior to construction*
AIA-3	*If during ground clearance or construction, any dense accumulations of stone tools, particularly if they are associated with ostrich eggshell fragments, are uncovered then the ECO should report this to SAHRA (Tel: 021 462 4502).*
AIA-4	*If any human remains are uncovered during construction, the ECO should have the area fenced off and contact SAHRA (Tel: 021 462 4502) immediately.*
PIA-1	*It is therefore recommended that, pending the discovery of significant new fossils remains before or during construction, exemption from further specialist palaeontological studies and mitigation be granted for the proposed Humansrus Solar 3 alternative energy development on Farm Humansrus 147 near Copperton.*
PIA-2	*Should any substantial fossil remains (e.g. well-preserved stromatolites, mammalian bones and teeth) be encountered during excavation, however, these should be safeguarded, preferably in situ, and reported by the ECO to SAHRA, i.e. The South African Heritage Resources Authority, as soon as possible (Contact details: SAHRA, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502 so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.*

The mitigations measures required by the specialists have been incorporated into the preferred Alterative 1. Management requirements are included in the EMPr.

12 GEOTECHNICAL

A specialist Geotechnical Statement was undertaken by Mr Carel de Beer of Geotechnical Consult Services. The full statement is included as **Annexure E10** of this report.

The site conditions encountered on both these proposed development areas were classified as suitable (with precautions) for the development of the PV solar energy generating facilities. No geotechnical factors were identified that resulted in either of the proposed development areas being unsuitable for the development of the planned facilities, each with a planned capacity of up to 75 MW. The precautions identified are related to shallow soil profiles, with hardpan calcrete

occurring close to surface, requiring pre drilled rammed foundations rather than the conventional rammed foundations for founding the solar panel structures.

The whole property (Humansrus 147) is underlain by surface calcrete and Dwyka Tillite bedrock on a gentle undulating landscape with no major drainage features. The proposed development area for Humansrus Solar 3 PV Facility is also expected to be underlain by a shallow soil profile with hardpan calcrete overlying bedrock, requiring pre-drilled rammed foundations and result in intermediate to hard excavatability for trenches. No problem soils are expected, no mining activities (past or present) will impact the site and no shallow groundwater conditions are expected.

13 TRAFFIC IMPACT ASSESSMENT

A specialist Traffic Impact Assessment was undertaken by Mr Bradley Rabitte of Atlantic Energy Partners (AEP). The full report is included as **Annexure E11** of this report.

The scope of this report is to analyses all transport requirements needed to support the construction and development of the proposed Humansrus Solar 3 PV Facility.

The following main considerations have been devised in order to facilitate the development of this study:

- All local elements sourced within South Africa will be transported from the manufacturing centres (Johannesburg, Gauteng; Pinetown, KZN);
- All international elements required for development will be imported via the most feasible South African Port;
- The largest component to be transported will be 1 x 70t transformer (80MVA);
- The maximum vertical clearance will not exceed 4.2m for abnormal loads;
- All routes will follow national and provincial roads;
- All basic materials such as concrete and other road materials will be sourced from nearby towns; and
- Traffic accommodation measures will be taken during construction.

The following Assumptions are made for materials during the construction of Humansrus Solar 3 PV Facility:

- All basic building materials comprising concrete, road materials, etc., will be supplied out of local towns (Prieska and Kimberley) near to the site;
- All inverters and other locally assembled equipment will be delivered from the manufacturing centres, either out of Johannesburg, Gauteng, or Pinetown, KZN;
- All supplementary materials will be imported to nearby Ports and delivered to site via heavy vehicles with legal limits; and
- The 70t transformer that will be imported will require an Abnormal Load permit prior to transportation.

13.1.1 Access Points to Site

The Department: Roads & Public Works (DRPW) has granted a no objection to road access to Humansrus Solar 3 PV Facility facility off the R357. Three potential access options are proposed:

- Road Access alternative 1 (Alternative) sits close to the boarder of Farm 147 (29°58'1.58"S; 22°23'21.78"E). The access route feeds directly onto the most Northern corner of Humansrus Solar 3 PV Facility preferred layout - as shown in Figure 34.
- Road Access alternative 2 (Preferred) is 2,39km South-West of Road Access alternative 1 and feeds directly onto the Western corner of Humansrus Solar 3 PV Facility preferred layout (29°58'53.77"S; 22°22'25.91"E) - as shown in Figure 34. This option runs adjacent to an existing Eskom line where the already existing road will be used for access to the site. It is furthermore understood that Eskom plans to decommission this line.
- Road Access Alternative 3 (alternative) is positioned directly opposite Road Access alternative 2. It feeds onto the Southern portion of Humansrus Solar 3 PV Facility alternative site- as seen in Figure 34.

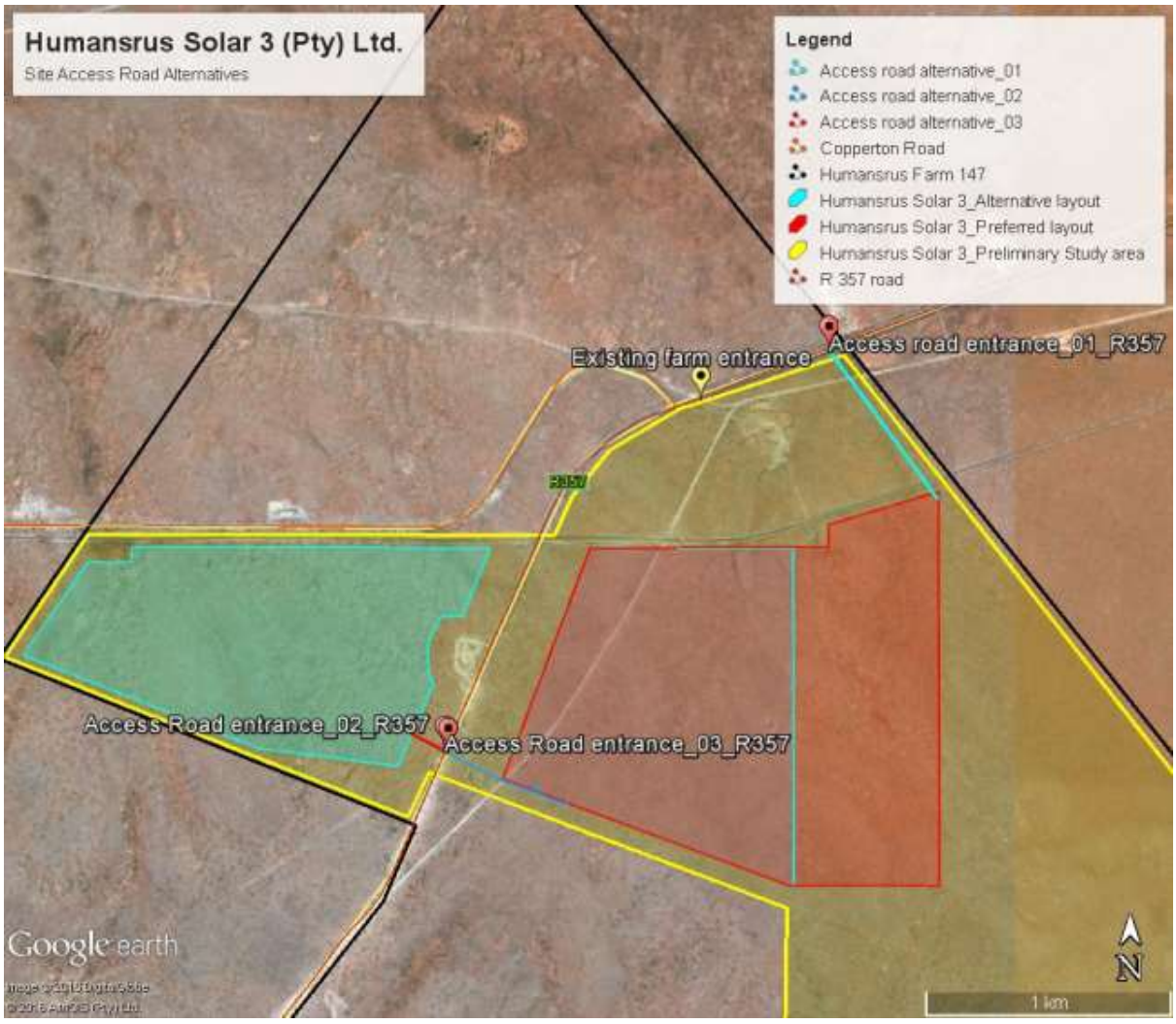


Figure 34: Access points off the R357 (Solek, 2016)

13.1.2 Traffic Volumes

It is estimated from previous projects (Humansrus Solar 1 Pty (Ltd) and Humansrus Solar 2 Pty (Ltd)) that the number of heavy vehicles per 7MW installation would be between 300 and 400 heavy vehicle trips depending on the site condition and founding requirements.

The project has a total capacity of 75MW which would therefore require 3000 to 4000 heavy vehicle trips. The estimated time period for construction is nine months to a year, averaging 15-20 trips/ day, which is not expected to have a significant effect on peak hour traffic.

According to the previous projects, the N10 experiences an Average Daily Traffic (ADT) of between 200-400 vehicles with a maximum hourly flow of 25 veh/hr.

As for the R357, a study was performed by Proman, which registered an ADT of 141 vehicles with a peak daily flow of 18 veh/hr. Therefore, it can safely be concluded that the increase in traffic flow due to the heavy vehicles travelling to site will not significantly increase congestion on either of the roads.

13.1.3 Access Route from Port

The Ports considered being the most practical for the imported elements were Port Elizabeth (P.E.)/Coega and Saldanha Bay, with P.E. being the preferred port. There are multiple routes that can be taken in order to transport elements to site. However, in accordance with the considerations outlined in Section 1 of the TIA, as well as the Ports Authority's preferences for freight transport, both transport routes were assessed.

13.1.4 Routes from Manufacturing Centres

The two main manufacturing centres to supply materials to site are Johannesburg (Gauteng) and Pinetown (KZN).

Johannesburg (Gauteng), will be used in order to provide all inverters and support structures. There are multiple routes to travel to site with all having relatively the same estimated time of arrival (ETA). The preferred route, has a total distance of 763km while travelling mainly along the N12. It must also be noted that traffic within the Johannesburg region can become congested on all main roads during rush hour times (7-8:30am). Therefore, alterations in route choice may be necessary depending on what time freight is in transit.

The other main centre, Pinetown (Kwazulu-Natal), will be used to assemble all modules required. There are multiple routes for transit. However, the preferred route, was chosen as this has the smallest ETA with a total distance of 1055km. Alternative routes can be used as standby in case of unforeseen events occurring. It must also be noted that all three route options have toll segments.

13.1.5 Traffic Accommodation during Construction

During the construction of the access points to site, the route off the R357 will need to be upgraded in order to meet SANRAL standards. A T-Junction will need to be constructed at the access point. This construction will need to adhere to Traffic Accommodation as per Standards set by the Department of Transport and Public Works. All temporary road signs will need to comply with that of the South African Road Traffic Signs Manual.

13.1.6 Conclusions and Recommendations

It can be concluded that there are no evident problems to be expected while hauling freight along any of the transport routes to site. However, it is advised that routes must be adapted in situations of unforeseen events occurring.

The following recommendations were drawn according to the investigation on the Traffic Impact Assessment and Management Study for Humansrus Solar 3 PV Facility:

- 'Access Road Entrance 2_Preferred' shall be considered the preferred option to site unless stated otherwise;
- Legal limits for normal heavy Vehicle freight will be required;
- All imported elements shall be delivered to the P.E. Port/Coega and transported to site. However, if this Port is unavailable, Saldanha Bay Port will be used as back up;

- All basic materials (concrete, road materials, etc.) shall be provided from nearby towns such as Prieska or Kimberley;
- All material required for transport from the manufacturing centres will occur predominately from Pinetown, KZN and Johannesburg, Gauteng;
- All permitting for abnormal loads, vertical height clearance, etc. shall be acquired prior to transit of elements;
- Toll fees will need to be met on particular transport route coming mainly from Pinetown, KZN;
- Routes will predominately occur on National and Provincial Roads with suitable standards for transport of container freight;
- There is limited risk of delays for normal routine pending maintenance work of the time of transit and scheduling of road contract.

14 EMI / RFI PATH LOSS REPORT

A specialist EMI/RFI Path Loss Report was undertaken by Interference Testing and Consultancy Services (Pty) Ltd (ITC). The full report is included as **Annexure E12** of this report.

The intention of this assessment is to determine technology risks (power conversion, wireless control systems etc.) of the renewable energy system on the Square Kilometre Array (SKA).

The frequency band of concern for SKA mid-band is 200MHz to 20GHz. This assessment does not consider any potential telecommunication services or networks that are to be established as part of the operational plan.

This initial high level risk assessment would then enable one to estimate the maximum permissible radiated emissions from the equipment installed within the Humansrus Solar 3 PV Facility.

Figure 35: Location of nearest SKA stations (ITC, 2016)

14.1 RISK IDENTIFICATION

14.1.1 Technology Risks

The following building blocks are viewed as potential interference sources:

- PV tracker system
- Inverters (AC as well as DC path)
- PV Generator control and management
- Control and operations centre (computer equipment)

14.1.2 PV Tracker System

Relevant tracking system components are listed below:

- Drive unit for solar tracking
- Internal communication system (PLC)

All components used should be compliant to CISPR 11 Class A less the mitigation required per unit based on cumulative effect requirements for 720 units and the fact that the expected (calculated) path loss is less than the required path loss.

14.1.3 Inverter

Different inverter technologies are in use worldwide. Metal enclosures should be used for components installed at each panel. All components used should be compliant to CISPR 11 Class A less the mitigation required per unit based on cumulative effect requirements for 72 units and the fact that the expected (calculated) path loss is less than the required path loss.

14.1.4 PV Generator control and management

The communications infrastructure that enables the transfer of information between the various elements connected to the network, such as the local office of the SCADA and PLCs. will be a MODBUS RS485 protocol, and a triple-ring with multimode optical fibre cable that will interconnect all the nodes (PLCs and SCADA local post).

14.1.5 Control and operations centre

Equipment installed in the control and operations centre shall comply with CISPR 22 Class B. The control and operations building shielding effectiveness should be at least 17dB, unless a 17dB safety margin is added to the CISPR 22 Class B limit.

14.1.6 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. This will however be included in the measurement data of a single PV plant. Adding more plants will result in a theoretical increase of 10 log N dB where N equals the number of plants. For an additional 3 plants (4 in total) a margin of 6dB can be added to the expected emission field strength from a single plant

14.2 MITIGATION

Shielding and filtering solutions are available to ensure installed plant equipment emissions remain within SKA risk tolerances. From laboratory test experience it is known that insufficiently shielded cabling (looms) account for most of the non-compliance to specification levels. It would therefore be recommended to shield and correctly terminate the shields of all cables installed on

the PV project site. The shielding can be achieved with braids, but it is often easier to make use of a shielded conduit system as individual wires can be replaced without compromising the shielded integrity.

14.3 CONCLUSION

Based on the current SKA location information, a first order impact analysis shows a **possible interference scenario** between the Humansrus Solar 3 PV Facility and the SKA installations as shown. In order to negate the risk to an acceptable level, all equipment to be installed on site must comply with levels of 40dB below the CISPR 11 Class A limit as the primary mitigation measure to accommodate cumulative effect of the high number of potential sources. Where equipment exceeds this threshold, additional shielding and filtering should be implemented to reduce the electromagnetic emissions from the PV facility. Shielding and filtering solutions are available to ensure the required 40dB below CISPR 11 Class A for equipment is reached. Should all equipment comply with the required 40dB below CISPR 11 Class A emissions, the total installed plant equipment emissions is expected to remain approximately 15dB below the CISPR 11 Class A limit. The compliance of the total facility to 15dB below the CISPR 11 Class A emissions is expected to result in emissions within SKA risk tolerances.

15 SOCIO-ECONOMIC IMPACT ASSESSMENT

15.1 REGIONAL CONTEXT:

» Northern Cape is the largest Province with the smallest population in South Africa.

» At a Provincial level, the Northern Cape has been identified as the area with the highest potential for solar renewable energy generation, with high solar irradiation levels and the availability of vast tracts of land. There are already a number of solar facilities planned in the region.

» The Pixley ka Seme District Municipality (PKSDM) is declared as a Renewable Energy Hub seeking to attract foreign direct investments into solar, wind, hydro and biomass projects. The PKSDM and its eight local municipalities are currently promoting a green economy in the district that seeks to promote generated economic activities that preserve and enhance environmental quality while using natural resources more efficiently.

15.2 LOCAL CONTEXT:

» The study area is located in the Siyathemba Local Municipality (SLM), Ward 4, which falls within the greater PKSDM in the Northern Cape Province.

» The situational analysis and statistics presented in the baseline description of the SLM indicate the developmental challenges facing the SLM, such as poverty, unemployment and service delivery backlogs.

» The proposed development will support the social and economic development within the SLM through enabling skills development and training in order to empower individuals and promote employment creation within the local area. The development would mainly focus on economic benefits to the area and introduce a new industry into the local economy. Negative dimensions of impacts such as an influx of jobseekers into the area may put pressure on the provision of basic services and poverty levels.

15.3 DIRECT AREA OF INFLUENCE:

» A project's direct area of influence extends to a 50km radius from the project site.

- The Department of Energy (DoE) indicates that the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme offers great potential for positive socio economic outcomes- listed as job creation, local ownership, socio-economic development and enterprise development. All of which has to take place within 50km of the project site.
- The main urban town within the project's direct area of influence (within 50km radius) is Prieska. Other major towns in the SLM include Marydale and Niekerkshoop.
- An in-depth community needs analysis (CNA) will need to be carried out by the developer at a later stage to make sure that the real needs of communities are addressed by development programmes (in line with the local government) in order to significantly contribute towards local economic growth, Socio-Economic Development (SED) and Enterprise Development (ED). This will be undertaken in the event that the proposal obtains preferred bidder status.
- Potential negative impacts within the direct area of influence will be during the construction phase and will be associated with pressure on infrastructure (e.g. health facilities, basic services) and different social/cultural behaviour influences, for example if an external workforce is brought into the local area. Additional negative impacts such as an influx of jobseekers and the added pressure on the provision of basic services may occur. The development would mainly focus on economic benefits including economic growth and development (economic opportunities such as jobs and expenditure in the local area).

15.4 INDIRECT AREA OF INFLUENCE:

- Road users that use the R357 on a frequent basis as part of their daily or weekly movement patterns (people commuting between Prieska and Van Wyksvlei) are considered to be indirectly influenced. Construction vehicles and trucks will be utilising this road during the construction phase of the development (approximately ~15-20 trips per day), which will increase the traffic and may increase the wear and tear on these roads.
- An important stakeholder outside the direct area of influence is the Square Kilometre Array (SKA) project that is underway.
- Another indirect area of influence will be at a national level with the positive benefits of the generation of renewable energy that will contribute to South Africa's electricity market.

15.5 IMMEDIATE AREA OF INFLUENCE:

15.5.1 Site Context:

- The study area is located on privately owned land, within Farm 147 Humansrus.
- The study area is characterised by livestock farming.
- There are no farmsteads or residents living in the study area.
- There are no buildings or significant infrastructure located in the study area. There are no farmsteads or residents living on Farm 147 Humansrus.
- A decommissioned railway line runs along the northern boundary of the study site.
- The site is surrounded by similar agricultural land, used predominantly for sheep farming and the development of renewable energy facilities.

15.5.2 Adjacent landowners:

- Majority of the surrounding study area has a low number of farmsteads/buildings that are sparsely populated.
- The area is located within a livestock farming agricultural region.

» The area is presently used mainly for small livestock (sheep, goats) farming as well as renewable energy facilities. There are currently three developed solar energy facilities and two wind farms that are scheduled to be constructed in 2016 / 2017. There are also a number of farms that have received environmental authorisation for solar energy facilities and farms that are currently in the EIA process for solar developments. This implies that projects of the same nature have been consolidated in one area creating a renewable energy node.

» The settlement of Copperton and infrastructure of the now disused Copperton mine and slime dams also lie to the north-west of the proposed study area.

» There is a network of gravel roads and smaller farm tracks within the area, including servitudes along the existing 132 kV power lines which run across the middle of Farm Plastjambok RE/102, Farm 147 Humansrus and Farm Vogelstruis 1/104.

A survey of the adjacent landowners was undertaken to determine the type of activities / land uses surrounding the study area and to determine any sensitive social receptors that may be negatively impacted by the proposed development. All the adjacent landowners were interviewed either in person or telephonically. There were no major issues or concerns raised by the adjacent landowners and they were all very supportive of the proposed projects. The only issue that was raised was the impact from all the renewable developments on the roads (wear and tear) and the dust pollution increasing.

15.6 SOCIAL IMPACT ASSESSMENT

A specialist Social Impact Assessment was undertaken by Ms Candice Hunter of Savannah Environmental. The full report is included as **Annexure E13** of this report.

The environmental assessment framework for the assessment of impacts and the relevant criteria were applied to evaluate the significance of the potential social impacts.

15.6.1 Construction Phase Impacts

Impacts associated with the construction phase of a project are usually of a short duration (approximately 12-18 months) and temporary in nature, but could have long-term effects on the surrounding social environment if not managed appropriately.

Table 8: Summary of social impacts during construction phase (Savannah, 2016)

Construction Phase				
Nature: The creation of employment opportunities and skills development opportunities during the construction phase for the country and local economy				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without enhancement	**With enhancement**	**Without enhancement**	**With enhancement**
Extent	Local- Regional	Local- Regional	Local- Regional	Local- Regional
Duration	Short term	Short term	Short term	Short term
Magnitude	Moderate	Moderate	Moderate	Moderate
Probability	Probable	Highly probable	Probable	Highly probable
Significance	**Medium**	**Medium**	**Medium**	**Medium**
Status (positive or negative)	Positive	Positive	Positive	Positive
Reversibility	N/A			

Irreplaceable loss of resources	N/A
Can impacts be enhanced	Yes

Enhancement measures:

» If possible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria

» It is recommended that local employment policy is adopted to maximise the opportunities made available to the local labour force (sourced from Prieska, Marydale and Niekerkshoop within the SLM).

» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

» Where feasible, training and skills development programmes should be initiated prior to the commencement of the construction phase.

» A Community Liaison Officer should be appointed from the local community. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.

Residual impacts

» Improved pool of skills and experience in the local area

» Economic growth for small-scale entrepreneurs

» Temporary employment during the construction phase will result in jobs losses and struggles for construction workers to find new employment opportunities

The impact is assessed to be positive, local and regional in extent, temporary in duration, of moderate intensity, and highly probable with enhancement measures implemented. The impact is assessed to be of medium significance.

Table 9: Economic multiplier effects impact assessment (Savannah, 2016)

Construction Phase				
Nature: Significance of the impact from the economic multiplier effects from the use of local goods and services				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without enhancement	**With enhancement**	**Without enhancement**	**With enhancement**
Extent	Local- Regional	Local- Regional	Local- Regional	Local- Regional
Duration	Short term	Short term	Short term	Short term
Magnitude	Low	Moderate	Low	Moderate
Probability	Probable	Highly probable	Probable	Highly probable
Significance	**Low**	**Medium**	**Low**	**Medium**
Status (positive or negative)	Positive	Positive	Positive	Positive
Reversibility	N/A			
Irreplaceable loss of resources	N/A			
Can impacts be	Yes			

enhanced	

Enhancement

» It is recommended that a local procurement policy is adopted by the developer and EPC contractor to maximise the benefit to the local economy.

» Where feasible, the developer should develop a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors; these companies should be notified of the tender process and invited to bid for project-related work where applicable.

» It is recommended that goods and services are sourced from the local area as much as possible; engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.

Residual impacts

Improved local service sector, growth in local business

The impact is assessed to be positive; local to regional in extent; temporary in duration; moderate intensity; and highly probable. The impact is assessed to be of medium significance.

Table 10: Assessment of impacts from influx of in-migrants (Savannah, 2016)

Construction Phase				
Nature: Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of people				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Local	Local	Local	Local
Duration	Short-term	Short-term	Short-term	Short-term
Magnitude	Low	Minor	Low	Minor
Probability	Probable	Probable	Probable	Probable
Significance	**Low**	**Low**	**Low**	**Low**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Yes			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Yes			

Mitigation

» A ‘locals first’ policy should be advertised for construction employment opportunities, especially for semi and low-skilled job categories. Enhance employment opportunities for the immediate local area; Prieska, Marydale and Niekerkshoop.

» It is recommended that local employment policy is adopted to maximize the opportunities made available to the local labour force.

» Tender document should stipulate the use of local labour as far as possible.

» Recruitment of temporary workers at the gates of the development should not be allowed. A recruitment

office with a Community Liaison officer (that's been appointed from the local community) should be established in a nearby town to deal with jobseekers. » A security company is to be appointed and appropriate security procedures to be implemented. » Implement procedures for the control and removal of loiters at the construction site. » A Community Liaison Officer should be appointed from the local community. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
Residual impacts Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure and services.

The impact is assessed to be negative; local in extent; temporary in duration; minor intensity; and probable with mitigation measures. The impact is assessed to be of low significance with mitigation.

Table 11: Assessment of impacts on daily living and movement patterns (traffic impacts) (Savannah, 2016)

Construction Phase				
Nature: Temporary increase in traffic disruptions and movement patterns during the construction phase				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Local	Local	Local	Local
Duration	Short term	Short term	Short term	Short term
Magnitude	Low	Minor	Moderate	Low
Probability	Probable	Improbable	Probable	Probable
Significance	**Low**	**Low**	**Low**	**Low**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Yes			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Yes			
» **Mitigation** » Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers when travelling on roads. » All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential dust, noise and safety issues. » Heavy vehicles should be inspected regularly to ensure their road safety worthiness. » Provision of adequate and strategically placed traffic warning signs and control measures along the R357 to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be visible at all times. » Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.				

- The developer and engineering, procurement and construction (EPC) contractors must ensure that there is a dedicated safe entrance to the site, and an access control point at the entrance gate off the R357 on Farm 147 Humansrus.
- The developer and engineering, procurement and construction (EPC) contractors must ensure that the fencing or entrance gates along the access road must either be maintained in the present condition, or repaired if disturbed due to project activities.
- The developer and engineering, procurement and construction (EPC) contractor's responsibility is to ensure roads utilised are either maintained in the present condition or upgraded if disturbed due to project activities.
- A comprehensive employee induction programme must be implemented to cover land access protocols and road safety.
- A Community Liaison Officer should be appointed from the local community. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.

Residual impacts

None anticipated

The impact is assessed to be negative; local in extent; temporary in duration; minor intensity and probable with mitigation measures. The impact is assessed to be of low significance after mitigation. The preferred site layout is the most adequate as it can be accessed from the tarred section of the R357.

Table 12: Assessment of safety and security impacts (Savannah, 2016)

Construction Phase				
Nature: Temporary increase in safety and security concerns associated with the influx of people during the construction phase				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Local	Local	Local	Local
Duration	Short term	Short term	Short term	Short term
Magnitude	Low	Minor	Low	Minor
Probability	Improbable	Improbable	Improbable	Improbable
Significance	**Low**	**Low**	**Low**	**Low**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Yes			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Yes			

Mitigation

- Working hours should be kept within daylight hours during the construction phase, and/or as any deviation that is approved by the surrounding landowners.
- The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site; the fencing of the site should be maintained throughout the construction periods.

» The appointed EPC contractor must appoint a security company and appropriate security procedures and measures are to be implemented. » Access in and out of the site should be strictly controlled by a security company. » The contractor should provide workers with identity tags and prohibit the access of unauthorized people to the construction site. » The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas. » Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff. » A comprehensive employee induction programme must be held, covering land access protocols, fire management and road safety. This must be addressed in the construction EMPr as the best practice. » All vehicles must be road worthy and drivers must be qualified and made aware of the potential road safety issues and follow the speed limits. » The contractor should have personnel trained in first aid on site to deal with smaller incidents that require medical attention. » A Community Liaison Officer should be appointed from the local community as a grievance channel. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process
Residual impacts None anticipated

The impact is assessed to be negative; local in extent; temporary in duration; minor intensity and improbable with mitigation measures. The impact is assessed to be of low significance with mitigation.

Table 13: Assessment of impacts for the access road alternatives relating to the preferred layout (Savannah, 2016)

Construction Phase				
Nature: Point of access off the R357 and nuisance impacts in terms of temporary increase in dust and the wear and tear on the R357				
	Alternative Access Road 1		**Alternative Access Road 2**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Local	Local	Local	Local
Duration	Short-term	Short-term	Short-term	Short-term
Magnitude	Low	Minor	Moderate	Low
Probability	Probable	Probable	Probable	Probable
Significance	**Low**	**Low**	**Low**	**Low**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Yes			
Irreplaceable loss of resources	No			
Can impacts be mitigated	Yes			

Mitigation

- Dust suppression measures must be implemented on a regular basis along the gravel roads utilised.
- The contractor must ensure that damage / wear and tear caused by construction related traffic to roads are repaired before the completion of the construction phase.
- Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
- Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential dust issues.
- A Community Liaison Officer should be appointed from the local community. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.

Residual impacts

Damage to roads that are not fixed could affect road users

The impact for alternative site access road 2 is assessed to be negative; local in extent; temporary in duration; low in intensity and improbable. The impact is assessed to be of low significance.

15.6.2 Operation Phase Impacts

The solar energy facility is designed to be operational for at least ~20-25 years. The potential positive and negative social impacts which could arise as a result of the operation of the proposed project include the following:

Table 14: Employment opportunities and skills development (Savannah, 2016)

Operation Phase				
Nature: The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without enhancement	With enhancement	Without enhancement	With enhancement
Extent	Local- Regional	Local- Regional	Local- Regional	Local- Regional
Duration	Long term	Long term	Long term	Long term
Magnitude	Minor	Minor	Minor	Minor
Probability	Probable	Highly probable	Probable	Highly probable
Significance	**Low**	**Medium**	**Low**	**Medium**
Status (positive or negative)	Positive	Positive	Positive	Positive
Reversibility	N/A			
Irreplaceable loss of resources	N/A			
Can impacts be enhanced	Yes			
» **Enhancement** » It is recommended that a local employment policy is adopted to maximise the opportunities made available to the local community. » The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.				

» Vocational training programs for employees should be established to promote the development of skills.
Residual impacts Improved pool of skills and experience in the local area

The impact is assessed to be positive; local to regional in extent; long-term; minor intensity and probable. The impact is assessed to be of medium significance with enhancement.

Table 15: Assessment of the development of clean, renewable energy infrastructure (Savannah, 2016)

Operation Phase				
Nature: Development of clean, renewable energy infrastructure				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without enhancement	**With enhancement**	**Without enhancement**	**With enhancement**
Extent	Local- Regional- National	N/A	Local- Regional- National	N/A
Duration	Long term	N/A	Long term	N/A
Magnitude	Minor	N/A	Minor	N/A
Probability	Highly probable	N/A	Highly probable	N/A
Significance	**Medium**	N/A	**Medium**	N/A
Status (positive or negative)	Positive	N/A	Positive	N/A
Reversibility	Yes			
Irreplaceable loss of resources	Yes (impact of climate change)			
Can impacts be enhanced	No			
Enhancement None anticipated				
Residual impacts » Reduce carbon emissions through the use of renewable energy and contribute to addressing climate change » Contribution towards security of electricity supply				

The impact is assessed to be positive; local to national in extent; long term; minor intensity; and highly probable. The impact is assessed to be of medium positive significance.

Table 16: Assessment of the benefits associated with REIPPPP - SED and ED programmes and community trust (Savannah, 2016)

Operation Phase
Nature: Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities

	PREFERRED LAYOUT		ALTERNATIVE LAYOUT	
	Without enhancement	**With enhancement**	**Without enhancement**	**With enhancement**
Extent	Local	Local	Local	Local
Duration	Long term	Long term	Long term	Long term
Magnitude	Low	Moderate	Low	Moderate
Probability	Probable	Highly probable	Probable	Highly probable
Significance	**Low**	**Medium**	**Low**	**Medium**
Status (positive or negative)	Positive	Positive	Positive	Positive
Reversibility	Yes			
Irreplaceable loss of resources	No			
Can impacts be enhanced	No			

Enhancement

» An in-depth community needs analysis (CNA) will need to be carried out to make sure that the real needs of communities are addressed (in line with the local government) and the correct representatives of the community are appointed to run the community trust.

» Engagement and involvement of the local municipality (SLM) and ward councillor with social responsibility plans.

Residual impacts

Improvements in local communities through socio-economic and enterprise development.

The impact is assessed to be positive; local in extent; long term; moderate intensity; and highly probable. The impact is assessed to be of medium positive significance.

Table 17: Iimpacts on sense of place assessment (Savannah, 2016)

Operation Phase				
Nature: Sense of place impacts associated with the operation phase of the solar energy facility and associated infrastructure				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Local	N/A	Local	N/A
Duration	Long term	N/A	Long term	N/A
Magnitude	Minor	N/A	Minor	N/A
Probability	Probable	N/A	Probable	N/A
Significance	**Low**	N/A	**Low**	N/A
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Yes			

Irreplaceable loss of resources	No
Can impacts be mitigated	Not applicable
Mitigation None anticipated.	
Residual impacts None anticipated if the visual impact will be removed after decommissioning, provided the site is rehabilitated to its original (current) status.	

The impact is assessed to be negative; local in extent; long term; low intensity; and probable. The impact is assessed to be of low significance, however review of the Visual Statement should be acknowledged and recommendations implemented.

Table 18: Impact assessment of the loss of agricultural land for livestock grazing (Savannah, 2016)

Operation Phase				
Nature: Impacts associated with loss of farmland available for livestock grazing due to occupation of land by the solar energy facility				
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Local	N/A	Local	N/A
Duration	Long-term	N/A	Long-term	N/A
Magnitude	Minor	N/A	Minor	N/A
Probability	Highly probable	N/A	Highly probable	N/A
Significance	**Low**	N/A	**Low**	N/A
Status (positive or negative)	Negative	N/A	Negative	N/A
Reversibility	Yes			
Irreplaceable loss of resources	No			
Can impacts be mitigated	No			
Mitigation None required				
Residual impacts Overall loss of farmland				

The impact is assessed to be negative; local in extent; long-term; minor intensity; and probable. The impact is assessed to be of low significance.

15.6.3 Cumulative Impacts

Cumulative impacts have been considered as part of the SIA and identified where relevant. The cumulative impacts of the project are related to the construction and operation phases.

Table 19: The other projects/ developments within 30km from the Humansrus Solar 3 PV Facility study area (Savannah, 2016)

Project Name	Location	Approximate distance from the PV Facility development site	Project Status
Garob Wind Farm 140MW	Portion 5 of Farm Nelspoortjie 103	Adjacent farm to the north east	Preferred Bidder (PB) Round 4.5: Construction to start in second quarter of 2016
Copperton Wind Farm 102MW	Portion 5 and portion 7 of Farm Nelspoortjie 103	Adjacent farm to the north	PB Round 4: Construction to start in 2016
Mulilo Renewable Energy Solar PV Facility 19.5MW	Farm Vogelstruis Bult 104	Adjacent farm to the north west	PB Round 1: in operation
Mulilo Sonnedix 75MW PV facility	The remaining extent of Farm Hoek Plaas 146	Adjacent farm to the south west	PB Round 3: in operation
Mulilo Prieska 75MW PV facility	Portion 4 of Farm Klipgats Pan 117	8.5km to south west	PB Round 3: in operation
Helena Solar 3 PV Facility 75MW	Portion 3 of Farm Klipgats Pan 117	13km to south west	Received Environmental Authorisation (EA)
Platsjambok West PV Facility	Portion 1 of Farm Kaffirs Kolk 118	9.5km to south west	Received EA
Platsjambok PV Facility	Remaining Extent of Farm Kaffirs Kolk 118	11.5km to south	Received EA
Platsjambok PV Facility	Portion 3 of Farm Kaffirs Kolk 118	9.5km to south	Received EA
Platsjambok East PV Facility	Remaining Extent of Farm Platsjambok 102	10km to south east	Received EA
Bosjesmansberg PV facilities X4	Portion 1 of Farm Bosjesmansberg 67	Adjacent farm to the north east	Received EA's
Kronos PV facilities X4	Portion 6 of Farm Nelspoortjie 103	Adjacent farm to east	Received EA's
Humansrus Solar 1 and 2 PV facilities	Farm 147 Humansrus	On impacted farm	Received EA's
Proposed Humansrus Solar PV Facility 4	Farm 147 Humansrus	On impacted farm	In process
Moiblox 75MW PV Facility	Remaining extent of Farm Bosjesmansberg 67	17km to the north east	In process
Renewable Energy	Portion 5 of Farm	25km to the north east	In process

Farm on Farm Doenies Pan (NK Energie (Pty) Ltd)	Doenies Pan 106		
Renewable Energy Solar Energy Facility on Farm Hedley Plains 64 (NK Energie (Pty) Ltd)	Portion 3 of farm Hedley Plains 64	30km to the north east	In process

It is clear from the above that there is a concentration of solar facilities in the broader area around Copperton. The potential for significant cumulative impacts is therefore likely to be high. This could result in positive permanent impacts on the economy, business development, employment and education in the area and the Province. It may also result in some negative impacts such as an influx of jobseekers and change of the landscape and the area's sense of place. The Humansrus Solar 3 PV Facility falls within the identified geographical area most suitable for the rollout of the development of solar energy projects within the Northern Cape Province as identified by the provincial SDF. This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented. It is also important to note that it is unlikely that all proposed renewable energy facilities located in the region will be built, due to capacity constraints on the Eskom grid and the limits placed on renewable energy targets. However, the cumulative social impacts from the proposed Humansrus Solar 3 PV Facility have been assessed to be acceptable (as detailed below).

Table 20: Cumulative impacts of employment opportunities, business opportunities and skills development (Savannah, 2016)

Nature: An increase in employment opportunities, skills development, SED and business opportunities with the establishment of more than one solar energy facility		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local- Regional	Local- regional
Duration	Long term	Long term
Magnitude	Minor	Moderate
Probability	Probable	Probable
Significance	**Low**	**Medium**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Confidence in findings	High	
Enhancement The establishment of a number of solar energy facilities in the area does have the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development, business opportunities and SED. The positive benefits will be enhanced if local employment policies are adopted and local services providers are utilised by the developers to maximise the project opportunities available to the local community.		

The impact is assessed to be positive; local to regional in extent; long-term; moderate intensity and probable. The overall impact is likely to have a medium positive significance to the local area.

Table 21: Cumulative impacts with in-migration of people (Savannah, 2016)

Construction & Operation Phase		
Nature: Negative impacts and change to the local economy with an in-migration of labourers and jobseekers to the area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Minor	Low
Probability	Improbable	Probable
Significance	**Low**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Confidence in findings	High	
Mitigation » Develop a recruitment policy/ process (to be implemented by contractors), which will source labour locally, where feasible. » Working together with government agencies to ensure service provision is in line with the development needs of the local area. » Forming joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services.		

The impact is assessed to be negative; local to regional in extent; long-term; moderate intensity and probable. The overall impact is likely to have a medium negative significance to the local area.

Table 22: Cumulative impacts associated with nuisance impacts (noise, dust and traffic) (Savannah, 2016)

Construction Phase		
Nature: Increase in traffic disruptions and increase in noise and dust with other solar energy facility developments		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local	Local
Duration	Short term	Long term

Magnitude	Low	Moderate
Probability	Probable	Probable
Significance	**Low**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Confidence in findings	High	

- **Mitigation**
- Dust suppression measures must be implemented on a regular basis.
- Vehicles used to transport sand and building materials are fitted with tarpaulins or covers when travelling on roads.
- Speed limits must be imposed on internal roads to limit dust generation
- Ensure all vehicles are roadworthy, drivers are qualified, obey traffic rules, follow speed limits and are made aware of the potential noise, dust and road safety issues.
- Working hours to be appropriately arranged during the construction phase, and/or as any deviation that is approved by the surrounding landowners.
- Heavy vehicles should be inspected regularly to ensure their road safety worthiness.
- Provision of adequate and strategically placed traffic warning signs and control measures along the R357 to warn road users of the construction activities taking place. Warning signs must be visible at all times.
- Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.
- The developer and engineering, procurement and construction (EPC) contractors must ensure that any damage / wear and tear to the roads caused by construction related traffic/ project activities is repaired.
- A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained, by the Contractor and monitored by the ECO, to record all complaints and queries relating to the project and the action taken to resolve the issue.

The impact is assessed to be negative; local in extent; temporary in duration; low intensity and probable with mitigation measures. The impact is assessed to be of low significance to the decision making process.

Table 23: Cumulative impacts on sense of place assessment (Savannah, 2016)

Operation Phase		
Nature: Change in the sense of place impacts associated with the establishment of more than one solar energy facility in the area		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Minor	Low

Probability	Probable	Probable
Significance	**Low**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Confidence in findings	High	
Mitigation None anticipated from a social perspective		

The impact is assessed to be negative; local to regional in extent; long-term; low intensity and probable. The overall impact is likely to have a medium negative significance to the local area.

15.6.4 Decommissioning Impacts

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in 20 - 25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the job losses typically associated with decommissioning however for a limited period of time.

Table 24: Social impacts associated with decommissioning (Savannah, 2016)

Nature: Social impacts associated with retrenchment including loss of jobs and source of income		
	Without Mitigation	**With Mitigation**
Extent	Local	Local
Duration	Short term	Short Term
Magnitude	Moderate	Low
Probability	Highly Probable	Highly Probable
Significance	**Medium**	**Low**
Status	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	

Mitigation » Implementation of a retrenchment and downscaling programme » All structures and infrastructure associated with the proposed facility should be dismantled, removed and transported off-site on decommissioning, and the landscape rehabilitated/ re-vegetated.
Cumulative impacts Loss of jobs and associated loss of income etc. can impact on the local economy and other businesses. However, decommissioning can also create short term, temporary employment opportunities associated with dismantling etc.
Residual impacts Loss of jobs and associated loss of income, can impact on local economy and other businesses.

The impact is assessed to be negative; local in extent; short term; low intensity; and highly probable. The impact is assessed to be of low significance to the decision-making process.

15.6.5 Conclusion

From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings have been made:

- The preferred access road option from a social perspective is the preferred access road 2.

» The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of PV facilities (these relate to influx of non-local workforce and jobseekers, intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.

» Employment opportunities will be created in the construction and operation phase and the impact is rated as positive even if only a small number of individuals benefit in this regard.

» The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operation phases.

» Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.

» The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the increased awareness of climate change, represents a positive social benefit for society as a whole.

15.6.6 Recommendations

Based on the social assessment, the following recommendations are made:

» It is important to appoint a **community liaison officer** from the local community to assist with the management of social impacts and to deal with community issues.

- In terms of employment related impacts, it is important to consider that job opportunities for the unskilled and semi-skilled in the study area could create competition among the local unemployed. Introducing an outside workforce will therefore most likely worsen local endeavours to obtain jobs and provoke discontent as well as put pressure on the local services available. It is imperative that **local labour be sourced** from SLM to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities where possible. Local procurement of labour and services/products would greatly benefit the community during the construction and operation phases of the project.
- **Local procurement of services and equipment** (where possible) in order to enhance the multiplier effect. This would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.
- Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Implement mitigation measures to reduce and avoid negative impacts.
- Employ mitigation measures to minimise the dust pollution and damage to existing roads.
- Safety and security risks should be taken into account during the planning/construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.
- From a social perspective it is recommended to choose the preferred access road 2 to reduce dust pollution and impacts from wear and tear on the R357.

15.6.7 Overall Conclusion

The proposed Humansrus Solar 3 PV Facility and associated infrastructure is **unlikely to result in permanent damaging social impacts**. The potential for positive socio-economic benefits can be realised, and this has been proven through the three projects which have already been constructed and are operational in the immediate area. There is no also no opposition to the project from local landowners, councillors or community representatives. From a social perspective it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report.

16 PLANNING CONTEXT

The target property, Remainder of Farm 147 Humansrus, is currently zoned Agriculture I, with limited grazing activities taking place.

It must be noted that the property is located within a **Solar Corridor** as per the Northern Cape PSDF which supports the strategic development in areas identified by the competent authority.

A **land use change application** for the rezoning of approx. 300ha, from **Agricultural Zone I to Special Zone**, will be lodged at the Siyathemba Local Municipality, in accordance with the Northern Cape Planning and Development Act (Act 7 of 1998).

Where applicable, the consent of SANRAL, Civil Aviation Authority (CAA) and the bondholder will be obtained as part of the rezoning application.

If there are restrictive Title Deed conditions burdening the proposed development, an application for the removal thereof will be lodged at the Government of the Northern Cape Province, Department: Corporate Governance and Traditional Affairs, in accordance with the Removal of Title Deed Restriction Act (Act 84 of 1967).

Parallel to the rezoning application, a **long term lease application will be lodged at the National Department of Agriculture**, in accordance with the Subdivision of Agricultural Land Act (Act 70 of 1970).

Relevant planning documents, on all spheres of Government, will be evaluated before any land use change application is launched. These documents include, but are not limited to the following: **NSDP** (National Spatial Development Perspective); **PGDS NC** (Provincial Growth and Development Strategy), Northern Cape Province; and the Siyathemba Municipal **IDP** (Integrated Development Plan) and **SDF** (Spatial Development Framework).

17 IMPACT ASSESSMENT SUMMARY & MITIGATIONS

Overall impacts across all disciplines range between Low to Medium with mitigation measures.

17.1 AGRICULTURE

Overall the impacts associated with the proposed activity have been rated as low with mitigation. The ratings apply equally to both proposed Alternatives.

Table 25: Agricultural Impact Assessment (Lubbe, 2016)

Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Level of significance	Significance after mitigation
Loss of agricultural land	Development site	Long term	Low	Highly probable	Low	Low
Land surface disturbance, changing run-off characteristics and increasing erosion risks	Development site	Short term	Low	Highly probable	Low	Low
Loss of topsoil	Site and its immediate surroundings	Short term	Low	Improbable	Low	Low
Placement of spoil material during construction.	Site and its immediate surroundings	Short term	Low	Improbable	Low	Low
Generation of alternative farm income	Development site	Long term	Low	Improbable	Low	Low

17.1.1 Agricultural Mitigations

- Ensure protection against soil erosion and loss of topsoil from wind and water at all times.

Both development alternatives have incorporated the specialist constraints and the mitigations have been included in the EMPr for implementation in the construction, operation and decommissioning phases.

17.2 ECOLOGICAL

There are no impacts associated with the development that cannot be mitigated to a low level and as a result, the site is considered to be a favourable location for the development. The ratings apply to both of the proposed Alternatives with a slight preference for Alternative 1 as it completely avoids sensitive features and is not fragmented.

Table 26: Summary of ecological impacts (Todd, 2016)

Phase & Impact	Without Mitigation	With Mitigation
Planning & Construction		
Impacts on vegetation and listed or protected plant species resulting from construction activities	Medium Negative	Medium-Low Negative
Direct Faunal Impacts During Construction	Medium Negative	Medium-Low Negative
Soil Erosion Risk During Construction	Medium-Low Negative	Low Negative
Operation		
Alien Plant Invasion Risk During Operation	Medium Negative	Low Negative
Soil Erosion Risk During Operation	Medium Negative	Low Negative
Faunal impacts during operation:	Medium-Low Negative	Low-Negative
Cumulative Impacts		
Impact on broad-scale ecological processes due to cumulative loss and fragmentation of habitat	Medium-Low Negative	Low Negative

17.2.1 Ecological Mitigations

17.2.1.1 Construction:

- Preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions.
- Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- Eco to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.
- Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.
- Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.

- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- If trenches need to be dug for water pipelines or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.
- Dust suppression and erosion management should be an integrated component of the construction approach.
- Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas.
- Regular monitoring for erosion problems along the access roads and other cleared areas.
- Erosion problems should be rectified on a regular basis.
- Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season.
- A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

17.2.1.2 Operation:

- Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
- The recovery of the indigenous vegetation should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.
    - Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.
    - Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.
    - Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.
    - All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
    - Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
    - All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
    - All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.

- No unauthorized persons should be allowed onto the site.
- Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- If the facility is to be fenced, then the electrified strands should be on the inside of the fence as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour by retreating into their shells and are killed by repeated shocks.

17.2.1.3 Cumulative:

- Minimise the development footprint as far as possible and allow the retention of some natural vegetation between the rows of panels or trackers.
- The facility should be fenced off in a manner which allows fauna to pass by the facility as easily as possible. This implies not fencing-in large areas of intact vegetation into the facility and only the developed area should be fenced.

Both development alternatives have incorporated the specialist constraints and the mitigations have been included in the EMPr for implementation in the construction, operation and decommissioning phases.

17.3 AVIFAUNAL

The study area and more specifically the recommended development area are not considered unique habitats in the landscape and are already subject to varying degrees of transformation and degradation. Although two threatened and/or priority species were recorded on-site – Kori Bustard and Karoo Korhaan – the area is not considered critical for their conservation and the extent of habitat loss for these species would be considered low.

The development will pose several impacts to avifauna, including: a low displacement impact caused by disturbance and habitat destruction associated with construction and maintenance activities of the proposed SEF and its associated power infrastructure; a low impact of electrocutions of birds on power infrastructure, with the implementation of mitigation measures; and a medium impact of avian collisions with power line infrastructure and solar panels.

The proposed Humansrus Solar 3 PV Facility and its associated power infrastructure (i.e. overhead transmission lines) have been assessed separately, however the conclusion is that it would result in having an overall **medium-low** impact to priority species and general avifauna occurring in the study area and broader impact zone of the development. The ratings apply equally to both proposed Alternatives.

17.3.1 Avifaunal Mitigations

17.3.1.1 Construction phase: SEF

- All construction activities must be carried out according to the generally accepted environmental best practise and the temporal and spatial footprint of the development should be kept to a minimum.
- Care must be taken in the vicinity of sensitive microhabitats such as the *Ephemeral pans* habitat unit.
- Existing roads must be used as much as possible for access during construction.
- The boundaries of the development area are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint.
- Provide adequate briefing for site personnel.
- Any bird nests that are found during the construction phase must be reported to the Environmental Control Officer (ECO).
- The above measures must be covered in a site specific EMPr and controlled by an ECO.
- During construction, if any priority species identified in this report are observed to be roosting and/or nesting and breeding in the vicinity, the ECO must be notified.
- The construction camps and laydown areas and site offices etc. must be as close to the site as possible.
- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all internal roads.

17.3.1.2 Construction phase: Grid Connection (transmission lines)

- All construction activities must be carried out according to the generally accepted environmental best practise and the temporal and spatial footprint of the development should be kept to a minimum.
- Care must be taken in the vicinity of sensitive microhabitats such as the *Ephemeral pans* habitat unit.
- Existing roads must be used as much as possible for access during construction.
- The boundaries of the development area are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint.
- Provide adequate briefing for site personnel.
- Any bird nests that are found during the construction phase must be reported to the Environmental Control Officer (ECO).
- The above measures must be covered in a site specific EMPr and controlled by an ECO.
- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any priority species identified in this report are observed to be roosting and/or nesting and breeding in the vicinity, the ECO must be notified.

- The construction camps and laydown areas and site offices etc. must be as close to the site as possible.
- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all internal roads.

17.3.1.3 Operation phase: SEF

- If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling of panels or other problems, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed to fledge their chicks before nests are removed.
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.
- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all access roads.
- Monitor all avifaunal incidents or mortalities observed within the facility (recorded and documented with photographs to ensure correct identification).
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice.

17.3.1.4 Operation phase: Grid Connection (transmission lines)

- If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling or panels or other problem, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed to fledge their chicks before nests are removed.
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.
- Contractors and working staff should stay within the development area and movement outside these areas especially into sensitive avian microhabitats must be restricted.
- Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all access roads.
- A “Bird Friendly” structure, with a bird perch (as per standard Eskom guidelines) should be used for the tower infrastructure.
- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting, 2002).
- Installation of artificial bird space perches and nesting platforms, at a safe distance from energised components (Goudie, 2006; Prinsen *et al*., 2012).

- High sensitivity sections of the power line should be marked with Bird Flight Diverters (BFDs), on the earth wire of the line, 5 metres apart, alternating black and white to increase the visibility of the power line and reduce the likelihood of collisions.
- The power line route should be scanned at least twice a month for the first year after construction to identify and locations of high impact. All mortalities along the power line route should be recorded and if there are any sites where repeated mortalities have occurred, an avifaunal specialist should be consulted for advice on additional mitigation measures to be implemented.

Both development alternatives have incorporated the specialist constraints and the mitigations have been included in the EMPr for implementation in the construction, operation and decommissioning phases.

17.4 AQUATIC

The proposed layout for the solar energy facility will have a **negligible impact** on the aquatic environment. The project has adhered to past specialist recommendations and the infrastructure that would have posed even a slight risk to water resources has been moved outside of any direct wetlands or water course areas.

Furthermore, during the site visit, no aquatic protected or species of special concern (fauna & flora) were observed within the adjacent areas that will be used. Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be **LOW**. The ratings apply to both proposed Alternatives.

17.4.1 Aquatic Mitigations

- The proposed layout should be developed to avoid as many of the smaller drainage lines as possible.
- Where crossings do occur, designs will ensure that flow is not disrupted and that erosion protection is placed appropriately.
- Any stormwater within the site must be handled in a suitable manner to capture large volumes of run-off, trap sediments and reduce flow velocities.
- Any stormwater within the site must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments, and reduce flow velocities (e.g. water used when washing the mirrors).
- The project should also try capture and recycle any form of run-off created by the daily operations. This would minimise the amount of water required by the project, but also serve to limit the downstream impacts on the riparian systems through an increase in run-off, a situation that these systems are currently unaccustomed to.
- Any stormwater within the site must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the mirrors).

Both development alternatives have incorporated the specialist constraints and the mitigations have been included in the EMPr for implementation in the construction, operation and decommissioning phases.

17.5 INTEGRATED HERITAGE

17.5.1 Cultural Landscape

From a regional and natural landscape perspective, the proposed development site forms part of a highly-transformed landscape altered through mining activities as well as high concentration of proposals for development of several renewable energy (solar) facilities.

While the proposal would relate to a landscape modification, **the specialist does not consider that it would alter any natural or cultural landscape of cultural significance**. The ratings apply equally to both of the proposed Alternatives.

17.5.2 Visual

It is the findings of the visual specialist assessment that **all of the development alternatives** are suitable for development with mitigation. It was found that the proposed alternatives **would not constitute a significant visual impact** to the characteristic landscape.

17.5.3 Archaeology

Indications are that in terms of archaeological heritage the proposed activity is viable; **impacts are expected to be limited and controllable**. Construction of the proposed solar facility may proceed. Either layout (Alternative 1 and Alternative 2) is acceptable.

17.5.4 Paleontological

There is **no preference** on palaeontological heritage grounds for the preferred or alternative layout of the solar facility. Given the generally low palaeontological sensitivity of the Copperton region (based on several recent field studies in the area as referenced by the Palaeontologist), the cumulative impact of the proposed solar facility as well as several other local alternative energy developments is assessed as low.

17.5.5 Integrated Heritage Mitigations / Recommendations

Table 27: HIA Recommendations (De Kock, 2016)

	Recommended Conditions of Approval
VS-1	That a 75m No-go buffer from the R357 and Copperton roads be maintained.
VS-2	To reduce visual intrusion from the possible multiple power lines linking up to different proposed PV projects in the vicinity, it is recommended that the power lines as much as possible follow existing transmission line corridors.
VS-3	The lay down should be located away from the main roads (as much as possible).
VS-4	Dust control measures should be implemented when required.
VS-5	Lights at night have the potential to significantly increase the visual exposure of the proposed project. It is recommended that mitigations be implemented to reduce light spillage (refer to Addendum for general guidelines).
AIA-1	Indications are that in terms of archaeological heritage the proposed activity is viable; impacts are expected to be limited and controllable.
AIA-2	Due to potential cumulative impacts in the area, some limited sampling of artefactual material should occur prior to construction
AIA-3	If during ground clearance or construction, any dense accumulations of stone tools, particularly if they are associated with ostrich eggshell fragments, are uncovered then the ECO should report this to SAHRA (Tel: 021 462 4502).
AIA-4	If any human remains are uncovered during construction, the ECO should have the area fenced off and contact SAHRA (Tel: 021 462 4502) immediately.
PIA-1	It is therefore recommended that, pending the discovery of significant new fossils remains before or during construction, exemption from further specialist palaeontological studies and mitigation be granted for the proposed Humansrus Solar 3 alternative energy development on Farm Humansrus 147 near Copperton.
PIA-2	Should any substantial fossil remains (e.g. well-preserved stromatolites, mammalian bones and teeth) be encountered during excavation, however, these should be safeguarded, preferably in situ, and reported by the ECO to SAHRA, i.e. The South African Heritage Resources Authority, as soon as possible (Contact details: SAHRA, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502 so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

Both development alternatives have incorporated the specialist constraints and the mitigations have been included in the EMPr for implementation in the construction, operation and decommissioning phases.

17.6 GEOTECHNICAL

The whole property (Humansrus 147) is underlain by surface calcrete and Dwyka Tillite bedrock on a gentle undulating landscape with no major drainage features. The proposed development area for Humansrus Solar 3 PV Facility is also expected to be underlain by a shallow soil profile with hardpan calcrete overlying bedrock, requiring pre-drilled rammed foundations and result in intermediate to hard excavatability for trenches. **No problem soils** are expected, **no mining activities (past or present)** will impact the site and **no shallow groundwater** conditions are expected.

17.6.1 Geotechnical Mitigations

It is recommended that a detailed geotechnical site investigation be conducted to determine the detailed founding conditions for the site.

17.7 TRAFFIC

It can be concluded that there are no evident problems to be expected while hauling freight along any of the transport routes to site. However, it is advised that routes must be adapted in situations of unforeseen events occurring.

The following recommendations were drawn according to the investigation on the Traffic Impact Assessment and Management Study for Humansrus Solar 3 PV Facility:

- 'Access Road Entrance_2 Preferred' shall be considered the preferred option to site unless stated otherwise;
- Legal limits for normal heavy Vehicle freight will be required;
- All imported elements shall be delivered to the P.E. Port/Coega and transported to site. However, if this Port is unavailable, Saldanha Bay Port will be used as back up;
- All basic materials (concrete, road materials, etc.) shall be provided from nearby towns such as Prieska or Kimberley;
- All material required for transport from the manufacturing centres will occur predominately from Pinetown, KZN and Johannesburg, Gauteng;
- All permitting for abnormal loads, vertical height clearance, etc. shall be acquired prior to transit of elements;
- Toll fees will need to be met on particular transport route coming mainly from Pinetown, KZN;
- Routes will predominately occur on National and Provincial Roads with suitable standards for transport of container freight;
- There is limited risk of delays for normal routine pending maintenance work of the time of transit and scheduling of road contract.

17.8 EMI/RFI PATH LOSS

Based on the current SKA location information, a first order impact analysis shows a **possible interference scenario** between the Humansrus Solar 3 PV Facility and the SKA installations. However the requirement for compliance of the total facility to 15dB below the CISPR 11 Class A emissions will result in emissions within SKA risk tolerances.

17.8.1 Mitigations

- In order to negate the risk to an **acceptable level**, all equipment to be installed on site must comply with levels of 40dB below the CISPR 11 Class A limit as the primary mitigation measure to accommodate cumulative effect of the high number of potential sources.
- Where equipment exceeds this threshold, additional shielding and filtering should be implemented to reduce the electromagnetic emissions from the PV facility.
- Shielding and filtering solutions are available to ensure the required 40dB below CISPR 11 Class A for equipment is reached.
- Should all equipment comply with the required 40dB below CISPR 11 Class A emissions, the total installed plant equipment emissions is expected to remain approximately 15dB below the CISPR 11 Class A limit.

17.9 SOCIO-ECONOMIC

The environmental assessment framework for the assessment of impacts and the relevant criteria were applied to evaluate the significance of the potential social impacts. The proposed Humansrus Solar 3 PV Facility and associated infrastructure is **unlikely to result in permanent damaging social impacts**. From a social perspective it is concluded that the project could be developed

subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report. The ratings apply to both proposed Alternatives as there is no difference in the scope of the activity.

Table 28: Summary of social impacts during construction phase (Savannah, 2016)

CONSTRUCTION PHASE				
Impact	**Significance without Mitigation/ enhancement**	**Significance with Mitigation/ enhancement**	**Significance without Mitigation/ enhancement**	**Significance with Mitigation/ enhancement**
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
Direct employment and skills development	Medium Positive	Medium Positive	Medium Positive	Medium Positive
Economic multiplier effects	Low Positive	Medium Positive	Low Positive	Medium Positive
Influx of jobseekers	Low Negative	Low Negative	Low Negative	Low Negative
Impacts on daily living and movement patterns (traffic & nuisance impacts)	Low Negative	Low Negative	Low Negative	Low Negative
Safety and security risks	Low Negative	Low Negative	Low Negative	Low Negative

Table 29: Summary of social impacts during operation phase (Savannah, 2016)

OPERATION PHASE				
Impact	**Significance without Mitigation/ enhancement**	**Significance with Mitigation/ enhancement**	**Significance without Mitigation/ enhancement**	**Significance with Mitigation/ enhancement**
	PREFERRED LAYOUT		**ALTERNATIVE LAYOUT**	
Direct employment and skills development	Low Positive	Medium Positive	Low Positive	Medium Positive
Development of clean, renewable energy infrastructure	Medium Positive	N/A	Medium Positive	N/A

Benefits associated with REIPPPP socio-economic development plans and community trust	Low Positive	Medium Positive	Low Positive	Medium Positive
Visual and sense of place impacts	Medium Negative	Low Negative	Medium Negative	Low Negative
Impacts associated with the loss of agricultural land	Low Negative	N/A	Low Negative	N/A

Table 30: Summary of assessment of alternatives (Savannah, 2016)

OPERATION PHASE				
Impact	**Significance without Mitigation**	**Significance with Mitigation**	**Significance without Mitigation**	**Significance with Mitigation**
	Alternative Access Road 1		**Alternative Access Road 2**	
Assessment of the access road alternatives	Low Negative	Low Negative	Low Negative	Low Negative

Table 31: Summary of cumulative social impacts (Savannah, 2016)

CUMULATIVE IMPACTS		
Cumulative Impact	**Overall impact of the proposed project considered in isolation**	**Cumulative impact of the project and other projects in the area**
Positive Cumulative Impacts		
Cumulative impacts from employment, skills and business opportunities	Low	Medium
Negative Cumulative Impacts		
Cumulative impacts with large-scale in-migration of people	Low	Medium
Cumulative impacts of nuisance impacts (noise, dust & traffic)	Low	Medium
Cumulative impacts on the sense of place and landscape	Low	Medium

17.9.1 Socio-Economic Mitigations

Based on the social assessment, the following recommendations are made:

- It is important to appoint a **community liaison officer** from the local community to assist with the management of social impacts and to deal with community issues.
- It is imperative that **local labour be sourced** from the local municipal area to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities where possible. Local procurement of labour and services/products would greatly benefit the community during the construction and operation phases of the project.
- **Local procurement of services and equipment** (where possible) in order to enhance the multiplier effect. This would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.
- Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Implement mitigation measures to reduce and avoid negative impacts.
- Employ mitigation measures to minimise the dust pollution and damage to existing roads.
- Safety and security risks should be taken into account during the planning/construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.
- From a social perspective it is recommended to choose the preferred access road 2 to reduce dust pollution and impacts from wear and tear on the R357.

Both development alternatives have incorporated the specialist constraints and the mitigations have been included in the EMPr for implementation in the construction, operation and decommissioning phases.

18 PROCESS TO DATE

The steps followed for this Scoping & Impact Assessment process complies with Chapter 2, Regulation 3[4], as well as Chapter 4, Regulations 21[5] & 23 with regards to the circulation and submission of relevant scoping and impact assessment reports. Furthermore the public participation component of the process was undertaken in accordance with Chapter 6[6] of the National Environmental Management Act (NEMA), Regulation 982 – Environmental Impact Assessment Regulations 2014.

As part of the public participation process the following steps were taken to ensure compliance with the legislation and to allow ample opportunity for members of the public and key stakeholders to be involved and participate in the environmental process.

Please see **Appendix F** for evidence of the Public Participation process. The Public Participation Process has been undertaken according to the requirements of the new NEMA EIA regulations.

[4] Regulation 3 specifies 'timeframes'.
[5] Regulation 21 specifies 'submission of scoping report to competent authority' whilst Regulation 23 prescribes 'submission and consideration of environmental impact assessment report and environmental management programme'.
[6] Chapter 6 specifies 'public participation'.

Table 32: Summary of Initial Public Participation Process to date

CHRONOLOGY OF EVENTS	
DATE	**ACTION**
October 2015	**Site Notices** (English & Afrikaans) were placed on the boundary fence of Farm 147 Humansrus.
19 November 2015	**Notification** was sent to the Landowner of Remainder of Farm 147 Humansrus informing her of the development proposal and the environmental process to be followed.
19 November 2015	**Notifications** were sent to neighbouring landowners informing them of the development proposal and the environmental process, and inviting them to register as I&APs.
19 November 2015	The **Pixley ka Seme District Municipality and the Siyathemba Local Municipality** (which have jurisdiction over the area), as well as **State Departments** and other **organs of state** (including SANParks, Northern Cape Nature Conservation, Department of Agriculture, Forestry & Fisheries, Department of Minerals and Energy, Department of Water Affairs, SAHRA, Eskom, Civil Aviation Authority, SKA etc.), were notified and registered as key stakeholders.
20 November 2015	An **Advertisement** was placed in a regional newspaper (Noordwester), calling for stakeholders to register as Interested & Affected Parties and to review the Pre Application Scoping Report.
19 November 2015	A **Stakeholder Register** was opened and the details of all registered stakeholders entered for future correspondence.
20 November 2015	**Pre Application** Scoping Report was made available for a period of 21 days extending from **20 November to 10 December 2015**.
20 November 2015	Hard copies of the **Pre Application Scoping Report (SR)** have been placed at the Siyathemba Municipality offices (Prieska) and the Prieska Library, for public review. The DSR has also been made available on the *Cape EAPrac* website: www.cape-eaprac.co.za
8 January 2016	An **Application** for Environmental Authorisation was submitted to the Department of Environmental Affairs (DEA).
18 January 2016	DEA **acknowledged** receipt (13 January 2016) of the Application for Environmental Authorisation
18 January 2016	Registered Stakeholders and I&APs were sent notifications informing that of the availability of the Scoping Report for a review and comment period of 30-days.
20 January 2016	Hard copies of the **Scoping Report (SR)** have been placed at the Siyathemba Municipality offices (Prieska) and the Prieska Library, for public review. The SR has also been made available on the *Cape EAPrac* website: www.cape-eaprac.co.za
19 February 2016	Final Scoping Report submitted to DEA.
29 February 2016	DEA acknowledged receipt of the Final Scoping Report.
4 April 2016	DEA accepted the Final Scoping Report and Plan of Study for EIA. The application proceeded to Impact Assessment phase.
30 May 2016	Environmental Impact Assessment Report (EIAR) made available to all registered I&APs for review and comment for a period of **30 days** extending from **30 May to 29 June 2016**.
30 May 2016	Hard copies of the **Environmental Impact Assessment Report (EIAR)** have been placed at the Siyathemba Municipality offices (Prieska) and the Prieska Library, for public review. The EIAR has also been made available on the *Cape EAPrac* website: www.cape-eaprac.co.za

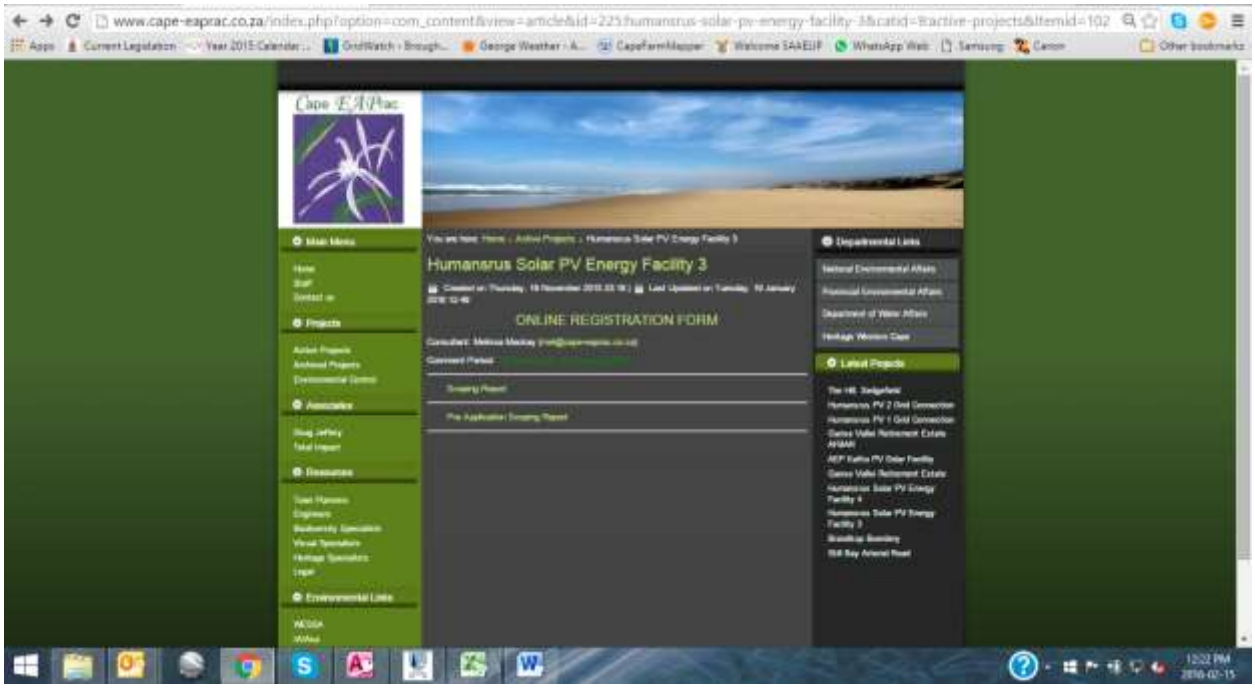


Figure 36: Website documents

Figure 37: Website Scoping Report

All comments received during the Scoping phase have been included in this EIAR as **Annexure F2**. Comments were received from the following stakeholders during the Scoping Report comment periods:

- **SKA** – The proposed facility is located within an area determined as high risk for EMI and RFI interference. A detailed analysis and potential impact must be provided. Since there are multiple projects proposed for the area, a cumulative assessment must be undertaken. SKA views the proposal to obtain detailed design for the approved Humansrus Solar 2 PV Facility as a means to inform possible impacts from this proposal as sufficient. Should the assessment indicate that a high level of risk still remains, SKA South Africa will continue to engage with the developers;

- **An EMI/RFI Path Loss Report has been undertaken and submitted to SKA for comment**. This report provides mitigation measures to minimise the interference on the SKA.

- **ESKOM** – All requirements for the construction of solar facilities and associated transmission lines must be complied with;
  - **The Eskom requirements for construction are included in the EMPr.**
- **Department of Agriculture, Forestry & Fisheries** – assess the impact on NFA listed tree species and if any encountered, amend the layout to avoid these trees. If no avoidance is possible, permits must be obtained;
  - **No species were identified by the specialist, however a walk through to ensure avoidance will be undertaken prior to construction** .
- **Regional Land Claims Commission: Northern Cape** – the department confirms that no restitution claims have been lodged against Farm 147 Humansrus.

This EIAR is being made available for comment for a period of **30 days** extending from **Monday 30 May to Friday 29 June 2016**. All comments received during this period will be collated and included in the final EIR for submission to the competent authority for decision making.

19 CONCLUSION & RECOMMENDATIONS

This environmental impact assessment exercise is currently being undertaken to present concept proposals to the public and potential Interested & Affected Parties, to identify environmental issues and concerns raised as a result of the proposed development alternatives to date, and to assess the impacts identified. The Humansrus Solar 3 PV Facility site has been assessed by Ecological, Agricultural Potential, Archaeological / Heritage / Paleontological / Visual, Avifaunal, Aquatic, Geotechnical, EMI/RFI and Socio-Economic specialists.

According to the specialist findings, the impacts associated with this development range between **Negligible to Medium / Low negative with mitigation** and some **positive socio-economic** impacts. No fatal flaws have been identified and all the specialists are satisfied that the development may be authorised with conditions.

The following conditions should be included in the EA:

- **SKA:**
    - Compliance with the threshold levels required by SKA SA in terms of allowable emissions within the AGA region is mandatory;
    - Any risk of detrimental impact must be mitigated prior to construction of the facility;
    - Any mitigation measures must be guaranteed to be effective as far as possible and to the theoretical levels identifed;
    - Any transmitters that are to be established, or have been established, at the site for the purposes of voice and data communication will be required to comply with the relevant AGA regulations concerning the restriction of use of the radio frequency spectrum that applies in the area concerned.
- **EMPr:**
    - All requirements of the EMPr must be complied with.
- **Specialist mitigations:**
    - All specialist mitigations as identified in the specific studies must be adhered to.

This Environmental Impact Assessment Report (EIAR) summarises the process to date, reports on the findings of relevant baseline studies and provides the impact assessments associated with the activity.

Cape EAPrac is of the opinion that the information contained in this EIAR and the documentation attached hereto is sufficient to allow the general public and key stakeholders to apply their minds to the potential negative and/or positive impacts associated with the development, in respect of the activities applied for. Having considered the information obtained through this assessment process *Cape EAPrac* is of the opinion that the proposed Humansrus Solar 3 PV Facility will be sustainable in the long term and that the proposed development will be an asset to the Prieska area, Siyathemba Local Municipality, Northern Cape region and the broader South African society through supplementing the electricity supply for the National Eskom Grid. This opinion has been reiterated by the various independent specialists.

This EIAR is simultaneously being submitted to the DEA and to registered stakeholders. The comment period for stakeholders is for a period of **30-days**, extending from **Monday 30 May to Friday 29 June 2016**.

All stakeholders are requested to review this Report and the associated appendices, and provide comment, in writing to *Cape EAPrac* within the specified 30-day comment period.

Comments must be submitted, in writing, to the following address no later than 29 June 2016:

ATT: Ms Melissa Mackay

Cape EAPrac

P.O. Box 2070, George, 6530 Tel: 044 874 0365 Fax: 044 874 0432

E-mail: mel@cape-eaprac.co.za

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