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SCOPING REPORT

in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

File Reference Number: Not issued yet

Project Title:

The development of a 400 MW solar photovoltaic (PV) facility (Phase 3) on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province, South Africa**.**

Prepared for

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June 3, 2022

(Draft for Comment)

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

DOCUMENT CONTROL

Table 1. Document Control.

COMPILED/REVISED BY	STATUS	REVISION	REVIEWED/ APPROVED BY	DISTRIBUTED ON
Shannon Farnsworth	Draft	00	Shaun MacGregor	June 2022

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
Reg: 2006/023163/23

CHECKLIST

Table 2. Content of Scoping Report in terms of Appendix 2 of the EIA Regulations, 2017.

1. "A scoping report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the environmental impact assessment process, and must include –"		
	YES	NO
(a) details of -	**SECTION A**	
(i) the EAP who prepared the report; and	X	
(ii) the expertise of the EAP, including a curriculum vitae;	X	
(b) the location of the activity, including-	**SECTION B**	
(i) the 21-digit Surveyor General code of each cadastral land parcel;	X	
(ii) where available, the physical address and farm name;	X	
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	N/A	
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is -	**SECTION C**	
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	X	
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	N/A	
(d) a description of the scope of the proposed activity, including-	**SECTION D**	
(i) all listed and specified activities triggered;	X	
(ii) a description of the activities to be undertaken, including associated structures and infrastructure;	X	
(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	**SECTION E** X	
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	**SECTION F** X	
(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including -	**SECTION G**	
(i) details of all the alternatives considered;	X	
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	X	
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	X	
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	X	

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(v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	X	
(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	X	
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	X	
(viii) the possible mitigation measures that could be applied and level of residual risk;	X	
(ix) the outcome of the site selection matrix;	X	
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	X	
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	X	
(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including-	**SECTION H**	
(i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;	X	
(ii) a description of the aspects to be assessed as part of the environmental impact assessment process;	X	
(iii) aspects to be assessed by specialists;	X	
(iv) a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists;	X	
(v) a description of the proposed method of assessing duration and significance;	X	
(vi) an indication of the stages at which the competent authority will be consulted;	X	
(vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and	X	
(viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process;	X	
(ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	X	
(i) an undertaking under oath or affirmation by the EAP in relation to-	**SECTION I**	
(i) the correctness of the information provided in the report;	X	
(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and	X	

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(iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	X	[redacted]
(j) an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;	**SECTION J**	
	X	[redacted]
(k) where applicable, any specific information required by the competent authority; and	**SECTION K**	
	X	[redacted]
(l) any other matter required in terms of section 24(4)(a) and (b) of the Act.	**SECTION L**	
	X	[redacted]

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EXECUTIVE SUMMARY

Introduction

ECOLEGES Environmental Consultants was appointed by Soventix South Africa (Pty) Ltd as the Environmental Assessment Practitioner to undertake the Scoping and Environmental Impact Assessment (S&EIA) for the proposed development of a 400 MW solar photovoltaic (PV) facility (Phase 3) located between De Aar & Hanover in the Northern Cape.

The National Department of Environmental Affairs granted an environmental authorisation with DEA Reference: 14/12/16/3/3/2/998 on 16th April 2018 (including two amendments in 2020 and 2021) for a 300 MW solar photovoltaic (PV) facility known as Phase 1. The applicant intents to develop two more 300 and 400 MW facilities (Phases 2 and 3, respectively). The two additional Solar PV will feed into the authorised sub-station on Phase 1. The required expansion of the substation footprint will require a third (Part 2) amendment to the existing environmental authorisation (DEA Reference: 14/12/16/3/3/2/998).

Locality

The proposed development is located approximately 35km South East of the town of De Aar in the Northern Cape. The property details are the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, between De Aar & Hanover which occur within the Emthanjeni Local Municipality, and the Pixley Ka Seme District Municipality**.**

Brief Project Description

The size of the proposed development footprint for a 400 MW solar PV facility is approximately 600 ha. The solar PV facility (which includes solar panels, inverters and transformers) will be connected to Eskom's electrical grid via an onsite substation and a 66 to 132 kV overhead distribution line.

The current land use is sheep farming, which will continue within the solar PV facility. This is achieved by adopting a symbiotic 'Agrivoltaic' system that combines agriculture with green energy generation, simultaneously supporting the agricultural and energy industries.

Listed and Specified Activities

An application for an EA has been submitted to the National Department of Forestry, Fisheries and the Environment (DFFE) in terms of the EIA Regulations, 2014 as amended to undertake listed activities 11, 19, 28, and 48 of **Listing Notice 1** (GG No. 40772, GN No. 327, 07th April 2017), listed activities 14 and 18 of **Listing Notice 3** (GG No. 40772, GN No. 324, 07 April 2017), and listed activities 2 and 15 of **Listing Notice 2** (GG No. 40772, GN No. 325, 07 April 2017).

None of the listed and/or specified activities that are triggered, and which require environmental authorisation, specifically include the term '*and related operation*'. Consequently, the scope of the activities pertaining to this project does not have an operational (or decommissioning) component.

Specialist Studies

The following specialist's studies have been identified to form part of the S&EIA process: Agricultural Agro-Ecosystem, Terrestrial Biodiversity, Animal and Plant Species, Avifauna, Bat Impact, Aquatic Biodiversity, Archaeological & Cultural Heritage, Palaeontological, Visual Impact, Hydrology, Geotechnical, Geo-Hydrological, Socio-Economic and Traffic Impact.

Public Participation

The level of public participation was determined by taking into account the scale of the anticipated impacts of the proposed development, the sensitivity of the affected environment and the degree of

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controversy of the project, and the characteristics of the potentially affected parties. Based on the findings of the above considerations, and taking cognisance of the Covid-19 pandemic, it was decided to fulfil the minimum requirements of the public participation process outlined in the EIA Regulations, 2014.

Alternatives

No alternatives other than the no-go option were identified for further assessment.

Solar PV facilities have a specific suite of requirements limiting site alternatives. The location of this application is further constrained by the fact that it is the third phase of a larger (1 GW) development, and therefore needs to be within close proximity to the authorised (Phase 1) development, and specifically the Main Transmission Substation where the electricity will tie into the national grid.

As such, the preferred layout will not be determined by an assessment of potential alternative configurations, but will be the product of a holistic and multi-disciplinary investigation, involving various online spatial planning tools and the site-specific findings and recommendations of all the specialist assessments.

No-go Option

The option of not implementing the activity is used as the benchmark against which all impacts associated with the proposed development were assessed. In this case, the no-go option would be to not rezone and develop Phase 3 to operate as an “Agrivoltaic” system and retain the land use for grazing sheep only.

Environmental Impacts Identified

Environmental aspects (or attributes) to be assessed as part of the environmental impact assessment process includes: Terrestrial & Avian fauna, Terrestrial flora, Aquatic fauna, Aquatic flora, Soil and Rock, Ground & Surface water, Atmosphere, Terrestrial Ecosystem, Aquatic Ecosystem, Economic, Social, Property, Land Use, Health & safety, Security, Public services, Visual aesthetics and Heritage and Culture.

An assessment of the preferred alternative site relative to the no-go alternative has shown that it is not only possible with mitigations to reduce the significance of environmental impacts to within acceptable limits, but in the case of the terrestrial ecosystem, even provide a powerful climate resilient land-use option that the no-go alternative (extensive livestock grazing only) cannot.

Conclusion

Southern Africa is witnessing an increased frequency and intensity in climate change-associated extreme weather events, causing water, food, and energy insecurity. The proposed development involving an ‘Agrivoltaic’ system can, if supported by sound ecological and water use management strategies, provide the kind of cross-sectoral climate change adaptation opportunity needed to respond to the challenge of climate change on the water-energy-food (WEF) nexus in Southern Africa.

Three concerns have been identified during the scoping phase which include: sustainable yields of groundwater in the underground aquifer, the protection and restoration of NFEPA wetlands and a Strategic Water Source Area, and the impact on high levels of local scenic quality (Karoo landscape).

With the exception of sustainable yields from the underground aquifer (as results of this study are still pending), potentially significant impacts to the aquatic ecosystem and scenic quality can be mitigated through appropriate ecological, massing and visual sensitivity buffers to reduce the significance of

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environmental impacts to within acceptable limits or at a cost that is acceptable for the predicted justifiable socio-economic outcomes and building resilience to climate change.

It is the EAP's opinion (for the reasons given below) that the proposed development on the preferred alternative site is the best practicable environmental option and should be subjected to an environmental impact assessment in order to comprehensively determine the feasibility of the project and mitigate impacts relating to its development (and operation).

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ABBREVIATIONS AND DEFINITIONS

Table 3. List of terms for abbreviations and acronyms used in this document.

Abbreviation	Term
CA	Competent Authority
DFFE	Department of Forestry, Fisheries and Environment (National)
DMR	Department of Mineral Resources
DENC	Department of Environment and Nature Conservation (Northern Cape)
DWS	Department of Water and sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ELM	Emthanjeni Local Municipality
ELU	Existing Lawful Use
GA	General Authorisation
GWh	Gigawatt per hours
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPR	Integrated Resource Planning
LA	Listed Activity (EIA Regulations, 2014)
LN1	Listing Notice 1: GN R. 327, 07 April 2017
LN2	Listing Notice 2: GN R. 325, 07 April 2017
LN3	Listing Notice 3: GN R. 324, 07 April 2017
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MTS	Main Transmission Station
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PDM	Pixley ka Seme District Municipality
PPA	Power Purchase Agreement
REFIT	Renewable Energy Feed-in Tariff

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SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
WUL	Water Use License

Table 4. Definitions of some terms used in this document.

Term	Source	Definition
Environmental Impact	ISO 14001: 2004	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from those elements of the proposed activities that can interact with the environment.
Scope	ISO 14001:2004	Refers to the extent and boundaries of the project including geographical location, a timeframe, organisational units, and activities.

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SECTION A: DETAILS OF THE EAP AND APPLICANT

2(1) A scoping report… must include –

- *details of – (i) The EAP who prepared the report; and (ii) The expertise of the EAP, including a curriculum vitae;*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Environmental Assessment Practitioner	Ecoleges Environmental Consultants
Contact Person	Shannon Farnsworth
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Project Applicant	Soventix South Africa (Pty) Ltd
Trading Name (if any)	Soventix South Africa
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Abbreviate Curriculum Vitae

SHANNON FARNSWOTH

Name	Shannon Farnsworth
Date of birth / **ID No.**	02 February 1990 9002020127087
Nationality	South African
Marital Status	Single
Current Address	Raptors View Wildlife Estate, Hoedspruit, Limpopo, South Africa Cell: 072 654 8202 E-mail: shannon@ecoleges.co.za
Languages	English, basic Afrikaans
Driver's Licence	Code B
Specialisations	Key Fields: environmental/ecological management plans, environmental auditing, Environmental Impact & Basic Assessment, protected area management
Qualifications & Courses Attended	**2009 – 2011** Bachelor of science: environmental management & geography, University of Kwa-Zulu Natal, Pietermaritzburg. **2012 – 2019** • Firearm training in the handle and use of handgun, shotgun, manual and self-loading operated rifle and carbine. • Environmental Management Inspector [EMI] basic training course for government officials conducted by the national Department of Environmental Affairs [DEA]. designated by the hon. MEC in KwaZulu-Natal for Economic Development, Tourism and Environmental Affairs, Mr. Sihle Zikalala, as a grade 2 environmental management inspector • Wetland wet-heath and Wet-ecoservices training provided by WESSA and UKZN • Certificate of successful completion of: basic Geographic Information Systems [GIS] arc 10 training course • Mini-SASS [stream assessment scoring system] by Duzi Umgeni Conservation Trust [DUCT] and the then Department of Agriculture and Environmental Affairs [DAEA]

	• Certificate of attendance issued by Maccaferri Africa for hydraulics: introduction to river protection and for hydraulics: introduction to coastal protection • Ecological infrastructure training workshop by WESSA
Memberships & Registrations	**2013 – Present:** Registered member of the South African Council for Natural Scientific Professions [SACNASP] as a Certified Natural Scientist in terms of section 20[3] of the *Natural Scientific Professionals Act, 2003 [Act 27 of 2003]* in the field of Environmental Science. Registration Number: 200215/13 **2020 – Present:** Registered as a professional Environmental Assessment Practitioner [EAP] with the Environmental Assessment Practitioners Association of South Africa [EAPASA]. Registration Number: 2020/176
Career Summary	**September 2021 – Current:** Environmental Assessment Practitioner – Ecoleges Environmental Consultants **December 2020 – Current:** Member of the Mopani District Municipal Planning Tribunal – Environmental Portfolio **February 2020 – November 2020:** Operational Management - African Dawn Safaris **April 2019 – December 2019:** Manager: Environmental Management Unit at Msunduzi Municipality **January 2012 – March 2019:** Environmental Scientist: Environmental Management Unit at Msunduzi Municipality **2008–2009:** Invasive Alien Plant planning, control, and eradication with Servest Landscapes.

SECTION B: LOCATION OF THE PROPOSED ACTIVITY

2(1) A scoping report… must include –

- *the location of the activity, including – (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in terms (i) and (ii) is not available, the coordinates of the boundary of the property or properties;*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Table 5. The 21-digit Surveyor General Codes of each cadastral land parcel.

Property Description	21-digit code
Remainder of Farm Goede Hoop 26C	C03000000000002600000
Portion 3 of Farm Goede Hoop 26C	C03000000000002600003

Postal Address: De Bad Farm, PO Box 65, Hanover, 7005

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SECTION C: LOCATION PLAN OF THE PROPOSED ACTIVITY

2(1) A scoping report… must include –

- *a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is – (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

The proposed development of a 400 MW solar photovoltaic (PV) facility, including PV modules and arrays, inverters and field transformers are just one part of the PV system. The field transformers must transfer and increase (step up) the voltage of the alternating-current circuit to Eskom's electricity grid via an on-site substation. Consequently, an on-site substation and a circa 32 m-wide servitude for a 66 kV to 132 kV distribution line will also be developed to evacuate the electricity generated on site and feed it into the national grid (via Phase 2).

Kindly note that all GPS co-ordinates given below are for the proposed positions of each listed activity that were identified during a preliminary investigation, and as such are subject to change depending on the outcome of the specialist studies and their recommendations, particularly relating to sensitive no-go areas, as well as the final layout plan to be determined by the engineers.

GPS co-ordinate of substation:

- Centre point: 30° 50‘ 52.7‘‘ S & 24° 22‘ 01.8‘‘ E

GPS co-ordinates for the proposed centre line of a 66 to 132 kV overhead distribution line:

- Start point: 30° 50‘ 52.7‘‘ S & 24° 22 ‘01.8‘‘ E
- Centre point: 30° 51‘ 11.1‘‘ S & 24° 21‘ 25.4‘‘ E
- End point: 30° 51‘ 28.1‘‘ S & 24° 20‘ 46.9‘‘ E

Please refer to the following Appendices for more details:

- **Appendix A:** SITE PLAN
- **Appendix B:** SITE PHOTOGRAPHS

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SECTION D: DESCRIPTION OF THE SCOPE OF THE PROPOSED ACTIVITY

2(1) A scoping report… must include –

- *a description of the scope of the proposed activity, including – (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken including associated structures and infrastructure.*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Project Background

In 2016 ecoleges undertook a S&EIA for the development of a 225 MW Solar PV facility between Hanover and De Aar in the Northern Cape. Three alternative footprints (PV01, PV02, PV03) were investigated during the assessment process. The central footprint (PV02) was identified as the preferred option because of its lower environmental impact and proximity to an existing 400kV Eskom powerline when compared with PV01 and PV03. The National Department of Environmental Affairs granted an environmental authorisation (DEA Reference: 14/12/16/3/3/2/998) on 16th April 2018. The activity must commence on the PV02 footprint within a period of five years from the date of issue.

An amendment to increase the capacity (not the footprint) of the facility to 300 MW due to technological advancements in solar photovoltaic efficiency and electrical output was granted on 24th November 2020.

A second amendment was granted in 2021 for the inclusion of containerised lithium-ion battery Storage and dual-fuel backup generators with associated fuel storage.

The competent authority was the National Department of Environmental Affairs because the application was part of the REIPPP or RMIPPP BID rounds, which formed part of a Strategic Infrastructure Project (SIP) as described in the National Development Plan, 2011. Soventix SA (Pty) Ltd was an unsuccessful bidder. However, the applicant has since partnered with another company, Solar Africa, with 1.5 GW in private renewable energy offtake agreements, making it economically feasible to develop two more 300 and 400 MW facilities (Phases 2 and 3, respectively).

Soventix will therefore apply for an environmental authorisation to develop an additional 300MW on the PV03 footprint (Phase 2) that was considered during the initial S&EIA. It is proposed to connect this second phase to the substation that forms part of the authorised facility on PV02 (Phase 1).

Unlike footprints PV02 and PV03, Phase 3 was not assessed during the S&EIA for Phase 1. Phase 3 involves the development of a third 400 MW Solar Photovoltaic (PV) facility on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C.

The two additional Solar PV facilities (Phase 2 and 3) will feed into the authorised sub-station on the PV02 footprint (Phase 1). Consequently, the required expansion of the substation footprint will require a third (Part 2) amendment to the existing environmental authorisation (DEA Reference: 14/12/16/3/3/2/998).

The proposed Phase 3 activity entails the construction of a 400MW solar photo-voltaic (PV) farm, in the form of 4 interconnected 100MW plants. An on-site substation will be required with the necessary infrastructure to feed the electricity generated, via cut and tie-in, into the Phase 2 substation via a proposed 66 kV – 132 kV overhead distribution line.

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Project Description

Size

The size of the proposed development footprint for a 400 MW solar PV facility is approximately 600 ha (1.5 ha per MW). Parts of the solar PV facility may be within 100 m and 500 m of a watercourse and wetland/pan, respectively (**S21(c) and (i)**).

PV System

The PV system is made up of the following components: solar panels or modules are connected to form arrays. The arrays are mounted onto a single-axis tracker and supported by steel or aluminium racks approximately 7.4 m apart. The panels would only incline to a position of 50 degrees when facing East and West. At full tilt the ground clearance will be 0.6 m with a maximum height of 4 m (3.4 m +0.6 m). Several arrays are then connected to an inverter. Approximately 2000 inverters will be cabled to 80 field transformers (twenty-five inverters are connected to a field transformer). The field transformers then transfer and increase (step up) the voltage of the alternating-current circuit to Eskom's electrical grid. Some of the underground cables from the field transformers to the on-site substation may cross a watercourse (**S21(c) and (i)**).

The current land use is sheep farming, which will continue within the solar PV facility to ensure minimal reduction (if any) on the agricultural potential of the land as well as a management tool to control vegetation growth.

On-site Substation and Distribution Line

The solar PV facility will be connected to Eskom's electrical grid via an onsite substation and a 66 to 132 kV overhead distribution line. The distribution line is approximately 20 m high, and the servitude width is approximately 32 m. The planned 66 kV to 132 kV distribution line will intersect an existing Eskom distribution line; Bletterman/Taaibos 1, 132 kV Overhead Line. A 10 to 15 m lightning mast will be erected within proximity to the on-site substation.

Vegetation Clearance

Vegetation will be cleared from the physical footprint of the construction camp (no more than 4 ha including laydown area), inverters, field transformers, on-site substation, rack foundations, pylon footings, underground cables and water pipes, roads (circa 400 km), a fire-break road and fencing posts, operational area (1 ha, but within the construction camp footprint), borrow pit (no more than 2 ha), water storage tanks and deionization plant(s).

Roads

Two-track roads

Two-track access roads will be placed between the parallel arrays during the construction phase, and a fire break, comprising a two-track dirt road with mowed vegetation will be created inside the perimeter fence.

Cleared/Graded Roads

Existing roads will be upgraded (graded 5 to 6 m wide, imported material, shaped for runoff, and compacted), including the servitude road under the Eskom 132 kV powerline and two road crossings (**S21(c) and (i)**) that will link the two areas separated by a watercourse. A third road crossing located on or downstream of the south-eastern boundary where the watercourse enters the property may be developed, either as a new build or as an upgrade to an existing two-track road crossing. Precast box culverts or pipes will also be required for the three road crossings. New roads, 5 to 6 m wide, will be

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built (graded, imported material, shaped for runoff, and compacted) to access the construction camp, which includes the laydown area and remains the site for the operational area, as well as to access components of the PV system, specifically field transformers and the on-site substation.

Passing Lanes

Passing lanes up to 8 m wide (not wider) will be placed at strategic areas on new roads. Considering existing roads are less than 8 m wide, they may be widened by more than 6 m for passing lanes without triggering listed activity 56 of Listing Notice 1. Existing roads within 100 m of a watercourse or wetland may be widened by more than 4 m but trigger Listed Activity 18 in LN3 (part of the application).

Borrow Pit(s)

Any fill material required for road construction will be obtained from existing borrow pits (no mining permit is required as per the exemption afforded in section 106 of the MRPDA) and/or a new borrow pit (not more than 2 ha in surface area) will be mined.

Construction

Heavy delivery vehicles will use the same staging area as for Phase 1 and 2. Materials, machinery and equipment will then be transferred onto lighter vehicles so that they can pass underneath Transnet's railway line unhindered and transported to the laydown area in the construction camp.

No accommodation facilities will be provided at the construction camp. Staff will be required to leave the site at the end of the day.

It is anticipated that the construction equipment will include at least: Water tankers, Graders, Tipper trucks, Drilling rigs, Mobile pile ramming machines, Rock Crushing Plant, Excavators, TLBs, Concrete mixers, Compaction equipment, Light delivery vehicles, and Heavy delivery vehicles (for the transformers).

Operational Area

The operational area comprises a controlled access (security gate), single-storey building, unpaved parking, and a sewerage treatment plant(s). The building shall be constructed from brick with metal sheet roofing and include space for an office, showers (incl. change rooms), medical room, control room, kitchen, storeroom, workshop, and containerised toilets.

Fencing

The facility will be fenced off with a galvanised diamond razor mesh security fence. The fence is embedded 300 mm into the ground and is 1.8 m high. Access will be controlled using a security gate. A 4 to 5 m-wide fire break road, comprising a two-track dirt road with mowed vegetation will be created inside the perimeter fence. Parts of the perimeter fence (and fire-break road) may cross a watercourse (**S21(c) and (i)**).

Lighting

The facility will not be lit up at night. The fence line will be secured using multiple FLIR PTZ cameras which have a 2 km range in absolute darkness (pers. comm. JP De Villiers, Managing Director Soventix). The obvious areas that would have lights is the control and security office, as well as the on-site substation, as it is a legal requirement.

Electricity

Electricity during construction and operation will be obtained from Eskom via the existing supply to the site.

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Access

The main access is off the N10 between De Aar & Hanover, which enters the site from the west. The provincial unsurfaced road (Burgersville District Road) and the existing farm access road will also be utilised. Once on the farm, an Eskom servitude road will be used to access the Main gate to the operational area and on-site substation.

Water

Estimated Demand

Groundwater will be required during construction for dust control (suppression) along principal access roads, mixing concrete and potable usage. Groundwater will be required during operation for potable usage, washing the modules, and livestock watering for the sheep. Groundwater will be supplied by two existing wind pump boreholes: one on each property. If viable a third borehole may be drilled to supplement water supply at the operational area.

Estimated Storage Requirements

The high concentration of ions in the borehole water will be removed by means of a deionization plant. The demineralised water will be stored in aboveground JoJo type storage tanks. The deionization plants and storage tanks will be located outside the 1:100-yr flood line (**S21(c) and(i) for piping water from borehole**). Water shall not be piped to any other area. Instead, it will be pumped into water bowsers and driven to those areas where it will be utilised, including additional storage tanks at the operational area, unless a third borehole is drilled at the operational area.

The additional storage tanks at the operational area, include those needed for:

1. storing drinking/potable water for staff,
2. storage of treated wastewater (from on-site disposal facility) for reuse (e.g., dust suppression), and
3. rainfall runoff from the roof.

Wastewater

The principal sanitation system during construction shall be a sewerage treatment package plant (**S21(g)**). Black water (flush toilet sewerage) and grey water (from hand wash basins) will be treated in a decentralised toilet block treatment system known as NEWGen100. NewGen100 is a compact containerised treatment unit that treats and recycles >99% of the flush toilet sewage from multiuser toilet blocks. The system is an autonomous, solar-powered, compact, and off-grid sewage treatment system which utilizes membrane biotechnology for the treatment of sewage from toilets for re-use in the toilets. A sub-surface soakaway will be required to dispose of the 'unrecycled' or excess treated effluent that cannot be reused for dust control/suppression.

The NewGen100 sanitation system will be supplemented by portable chemical toilets for use by the work front further away from the construction camp.

The principal sanitation system during operation shall be a sewerage treatment package plant (S21(g)). Black water (flush toilet sewerage) and grey water (hand wash basins in kitchen, change rooms, medical room, and/or workshop) shall be treated to general limits with a Biorock package plant, specifically the Multirock 60 treatment system. Biorock products are capable of recycling domestic sewerage to produce a high-quality final product fit for irrigation or to return safely to the local receiving environment. A sub-surface soakaway will be required to dispose of the treated and disinfected effluent that cannot be reused for dust control/suppression.

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Waste Management

General waste will be disposed of at the De Aar licensed landfill site. Electrical waste will either be recycled or disposed of at a licensed hazardous waste landfill.

Listed and Specified Activities

An application for an EA has been submitted to the National Department of Forestry, Fisheries and the Environment (DFFE) in terms of the EIA Regulations, 2014 as amended to undertake listed activities 11, 19, 28, and 48 of **Listing Notice 1** (GG No. 40772, GN No. 327, 07th April 2017), listed activities 14 and 18 of **Listing Notice 3** (GG No. 40772, GN No. 324, 07 April 2017), and listed activities 2 and 15 of **Listing Notice 2** (GG No. 40772, GN No. 325, 07 April 2017) (**Table 6**).

Table 6. All listed and specified activities triggered and being applied for.

Activity No(s):	Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 1** of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
LN 1, Listed Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is - (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	**The development of an on-site substation and 66 kV to 132 kV Distribution Line on land zoned as Agriculture (a rural area).** The solar PV facility will be connected to Eskom's electrical grid via an onsite substation and a 66 to 132 kV overhead distribution line. The distribution line is approximately 20 m high, and the servitude width is approximately 32 m. The planned 66 kV to 132 kV distribution line will intersect an existing Eskom distribution line - Bletterman/Taaibos 1, 132 kV Overhead Line. A 10 to 15 m lightning mast will be erected within proximity to the on-site substation. **GPS co-ordinate of substation:** 30° 50' 52.7'' S & 24° 22' 01.8'' E **GPS co-ordinate of 66 to 132 kV overhead distribution line:** Start point: 30° 50' 52.7'' S & 24° 22 '01.8'' E Centre point: 30° 51' 11.1'' S & 24° 21' 25.4'' E End point: 30° 51' 28.1'' S & 24° 20' 46.9'' E

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LN 1, Listed Activity 19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving - (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	**Upgrading existing and developing new road crossings through a watercourse** Existing roads will be upgraded (graded, imported material, shaped for runoff, and compacted), including *inter alia* up to three road crossings (S21(c) and (i)) that will link the two areas separated by a watercourse. A third road crossing located on or downstream of the south-eastern boundary where the watercourse enters the property may be developed, either as a new build or as an upgrade to an existing two-track road crossing. Precast box culverts or pipes will also be required for the three road crossings. **GPS co-ordinate of Road Crossing No. 1 (centre point):** 30° 49‘ 45.2‘’ S & 24° 20‘ 52.8‘’ E **GPS co-ordinate of Road Crossing No. 2 (centre point):** 30° 50‘ 09.0‘’ S & 24° 21‘ 24.3‘’ E **GPS co-ordinate of Road Crossing No. 3 (centre point):** 30° 50‘ 40.9‘’ S & 24° 22‘ 23.2‘’ E or 30° 50' 33.14" S & 24° 22' 12.53" E **The installation of a perimeter fence across a watercourse** The facility will be fenced off with a galvanised diamond razor mesh security fence. Parts of the perimeter fence (and fire-break road) may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of Perimeter Fence watercourse crossing No. 1 (centre point):** 30° 50‘ 26.22‘’ E & 24° 21‘ 30.70‘’ S **GPS co-ordinate of Perimeter Fence watercourse crossing No. 2 (centre point):**

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		30° 49‘ 52.38‘‘ S & 24° 21‘ 25.75‘‘ E **The excavation and laying of underground cables across a watercourse** Some of the underground cables from the field transformers to the on-site substation may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of underground cables area No. 1 (centre point):** 30° 50' 37.77" S & 24° 21' 30.26" E **GPS co-ordinate of underground cables area No. 2 (centre point):** 30° 50' 36.47" S & 24° 22' 9.54" E **GPS co-ordinate of underground cables area No. 3 (centre point):** 30° 49' 54.81" S & 24° 21' 53.63" E **The excavation and laying of underground pipes across a watercourse** Some of the underground pipes from the borehole(s) to the deionization plant(s) and storage tanks may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of Borehole No. 4:** 30° 49‘ 43.6‘‘ S & 24° 20‘ 55.1‘‘ E **GPS co-ordinate of Borehole No. 5:** 30 ° 49‘ 29.70 ‘‘ S & 24° 22‘ 7.31‘‘ E
LN 1, Listed Activity 28	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail,	**The development of a 400 MW Solar PV System on 600 ha of land zoned as Agriculture (in a rural area).** **GPS co-ordinate of Corner A:** 30º 50’ 12.2“ S & 24º 19‘ 58.7“ E **GPS co-ordinate of Corner B:** 30º 48‘ 48.5“ S & 24º 21‘ 26.4“ E **GPS co-ordinate of Corner C:** 30º 50’ 12.6“ S & 24º 23‘ 19.7“ E **GPS co-ordinate of Corner D:**

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	commercial, industrial, or institutional purposes.	30º 51' 07.4" S & 24º 21' 33.2" E
LN1, Listed Activity 48	The expansion of – (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion [or expansion and related operation] occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding - (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves.	**Upgrading (and expanding) existing roads in and within 32 m of a watercourse** Existing roads will be upgraded (graded, imported material, shaped for runoff, and compacted) and expanded up to a width of 5 – 6 m in and within 32 m of a watercourse, including *inter alia* up to three road crossings (S21(c) and (i)) that will link the two areas separated by a watercourse. **GPS co-ordinate of Road Crossing No. 1 (centre point):** 30° 49' 45.2'' S & 24° 20' 52.8'' E **GPS co-ordinate of Road Crossing No. 2 (centre point):** 30° 50' 09.0'' S & 24° 21' 24.3'' E **GPS co-ordinate of Road Crossing No. 3 (centre point):** 30° 50' 40.9'' S & 24° 22' 23.2'' E or 30° 50' 33.14" S & 24° 22' 12.53" E **The development of Passing Lanes within 32 m of a watercourse** Existing roads within 32 m of a watercourse may be widened to create a passing lane. **GPS co-ordinate of Road Crossing No. 1 (centre point):** 30° 49' 45.2'' S & 24° 20' 52.8'' E **GPS co-ordinate of Road Crossing No. 2 (centre point):** 30° 50' 09.0'' S & 24° 21' 24.3'' E **GPS co-ordinate of Road Crossing No. 3 (centre point):** 30° 50' 40.9'' S & 24° 22' 23.2'' E
Activity No(s):	Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 3** of the EIA Regulations, 2014 as amended.	Describe the portion of the proposed project to which the applicable listed activity relates.

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LN3, Listed Activity 14 (replaces LA12 of LN1)	The development of – (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. g. Northern Cape i. In an estuary; no ii. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; no (bb) National Protected Area Expansion Strategy Focus areas; no (cc) World Heritage Sites; no (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; no EMF (ee) Sites or areas identified in terms of an international convention; no (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; yes - Study area is in an ESA in the Northern Cape CBA Map 2016. (gg) Core areas in biosphere reserves; no (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; no (ii) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined. no	**The development of a 400 MW Solar PV System within 32 m of a watercourse** Parts of the PV system may occur within 32 m of a watercourse. **GPS co-ordinate of Corner A:** 30º 50' 12.2" S & 24º 19' 58.7" E **GPS co-ordinate of Corner B:** 30º 48' 48.5" S & 24º 21' 26.4" E **GPS co-ordinate of Corner C:** 30º 50' 12.6" S & 24º 23' 19.7" E **GPS co-ordinate of Corner D:** 30º 51' 07.4" S & 24º 21' 33.2" E **The development of two-track roads in and within 32 m of a watercourse** Two-track access roads will be placed between the parallel arrays during the construction phase, and a fire break, comprising a two-track dirt road with mowed vegetation will be created inside the perimeter fence. **GPS co-ordinate of Perimeter Fence watercourse crossing No. 1 (centre point):** 30° 50' 26.22'' E & 24° 21' 30.70'' S **GPS co-ordinate of Perimeter Fence watercourse crossing No. 2 (centre point):** 30° 49' 52.38'' S & 24° 21' 25.75'' E **The development of new roads within 32 m of a watercourse** New roads (5 – 6 m wide) including the occasional passing lane (up to 8 m wide) will be built (graded, imported material, shaped for runoff, and compacted) to access the construction camp, which includes the laydown area and remains the site for the operational area, as well as to access components of the PV system,

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		specifically field transformers and the on-site substation. Some of these new roads may be within 32 m of a watercourse. **GPS co-ordinate of Corner A:** 30º 50' 12.2" S & 24º 19' 58.7" E **GPS co-ordinate of Corner B:** 30º 48' 48.5" S & 24º 21' 26.4" E **GPS co-ordinate of Corner C:** 30º 50' 12.6" S & 24º 23' 19.7" E **GPS co-ordinate of Corner D:** 30º 51' 07.4" S & 24º 21' 33.2" E **Developing a new road crossing through a watercourse** A road crossing located on or downstream of the south-eastern boundary where the watercourse enters the property may be developed as a new build**.** Precast box culverts or pipes will also be required for the three road crossings. **GPS co-ordinate of new road centre point:** 30° 50' 33.14" S & 24° 22' 12.53" E **The installation of a perimeter fence in and within 32 m of a watercourse** The facility will be fenced off with a galvanised diamond razor mesh security fence. A 4 to 5 m-wide fire break road, comprising a two-track dirt road with mowed vegetation will be created inside the perimeter fence. Parts of the perimeter fence (and fire-break road) may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of Perimeter Fence watercourse crossing No. 1 (centre point):** 30° 50' 26.22'' S & 24° 21' 30.70'' E

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		GPS co-ordinate of Perimeter Fence watercourse crossing No. 2 (centre point): 30° 49‘ 52.38‘’ S & 24° 21‘ 25.75‘’ E **The excavation and laying of underground cables across a watercourse** Some of the underground cables from the field transformers to the on-site substation may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of underground cables area No. 1 (centre point):** 30° 50' 37.77" S & 24° 21' 30.26" E **GPS co-ordinate of underground cables area No. 2 (centre point):** 30° 50' 36.47" S & 24° 22' 9.54" E **GPS co-ordinate of underground cables area No. 3 (centre point):** 30° 49' 54.81" S & 24° 21' 53.63" E **The excavation and laying of underground pipes across a watercourse** Some of the underground pipes from the borehole(s) to the deionization plant(s) and storage tanks may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of Borehole No. 4:** 30° 49‘ 43.6‘’ S & 24° 20‘ 55.1‘’ E **GPS co-ordinate of Borehole No. 5:** 30 ° 49‘ 29.70 ‘’ S & 24° 22‘ 7.31‘’ E **Installation of water storage tanks and a deionization plant.** **GPS co-ordinate of Borehole No. 4:** 30° 49‘ 43.6‘’ S & 24° 20‘ 55.1‘’ E **GPS co-ordinate of Borehole No. 5:** 30 ° 49‘ 29.70 ‘’ S & 24° 22‘ 7.31‘’ E

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LN3, Listed Activity 18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. g. Northern Cape i. In an estuary; no ii. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; no (bb) National Protected Area Expansion Strategy Focus areas; no (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; no EMF (dd) Sites or areas identified in terms of an international convention; no (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; no - Study area is however in an ESA in the Northern Cape CBA Map 2016. (ff) Core areas in biosphere reserves; no (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or no (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; yes	**The development of Passing Lanes (for delivery vehicles during construction) on existing roads within 100 m of a watercourse or wetland** Passing lanes up to 8 m wide (not wider) will be placed at strategic areas on new roads (these do not require authorisation). Considering existing roads are less than 8 m wide, they may be widened by more than 6 m for passing lanes without triggering listed activity 56 of Listing Notice 1. However, existing roads within 100 m of a watercourse or wetland may be widened by more than 4 m, triggering Listed Activity 18 in LN3 (part of the application). **GPS co-ordinate of Corner A:** 30º 50' 12.2" S & 24º 19' 58.7" E **GPS co-ordinate of Corner B:** 30º 48' 48.5" S & 24º 21' 26.4" E **GPS co-ordinate of Corner C:** 30º 50' 12.6" S & 24º 23' 19.7" E **GPS co-ordinate of Corner D:** 30º 51' 07.4" S & 24º 21' 33.2" E **Upgrading (and expanding) existing roads in and within 32 m of a watercourse** Existing roads will be upgraded (graded, imported material, shaped for runoff, and compacted) and expanded up to a width of 5 – 6 m in and within 32 m of a watercourse, including *inter alia* up to three road crossings (S21(c) and (i)) that will link the two areas separated by a watercourse. **GPS co-ordinate of Road Crossing No. 1 (centre point):** 30° 49' 45.2'' S & 24° 20' 52.8'' E

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		GPS co-ordinate of Road Crossing No. 2 (centre point): 30° 50‘ 09.0‘‘ S & 24° 21‘ 24.3‘‘ E **GPS co-ordinate of Road Crossing No. 3 (centre point):** 30° 50‘ 40.9‘‘ S & 24° 22‘ 23.2‘‘ E or 30° 50' 33.10" S & 24° 22' 8.62" E
Activity No(s):	Provide the relevant **Scoping and EIR Activity(ies)** as set out in **Listing Notice 2** of the EIA Regulations, 2014 as amended.	Describe the portion of the proposed project to which the applicable listed activity relates.
LN 2, Listed Activity 2	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs - (a) within an urban area; or (b) on existing infrastructure.	**The development of a 400 MW Solar PV System on land zoned as Agriculture (in a rural area)** The PV system is made up of the following components: solar panels or modules are connected to form arrays. The arrays are mounted onto a single-axis tracker and supported by steel or aluminium racks approximately 7.4 m apart. The panels will only incline to a position of 50 degrees when facing East and West. At full tilt the ground clearance will be 0.6 m with a maximum height of 4 m (3.4 m +0.6 m). Several arrays are then connected to an inverter. Approximately 2000 inverters will be cabled to about 80 field transformers (twenty-five inverters are connected to a field transformer). The field transformers then transfer and increase (step up) the voltage of the alternating-current circuit to Eskom’s electrical grid. Some of the underground cables from the field transformers to the on-site substation may cross a watercourse (S21(c) and (i)). **GPS co-ordinate of Corner A:** 30º 50’ 12.2“ S & 24º 19‘ 58.7“ E **GPS co-ordinate of Corner B:** 30º 48‘ 48.5“ S & 24º 21‘ 26.4“ E **GPS co-ordinate of Corner C:** 30º 50’ 12.6“ S & 24º 23‘ 19.7“ E

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		GPS co-ordinate of Corner D: 30º 51' 07.4" S & 24º 21' 33.2" E
LN 2, Listed Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	**More than 20 ha of indigenous vegetation will be cleared.** Vegetation will be cleared from the physical footprint of the construction camp (no more than 4 ha including laydown area), about 2 000 inverters, about 80 field transformers, 1 on-site substation, rack foundations (to support the solar arrays), pylon footings, underground cables and pipes, roads (circa 400 km), a fire-break road and fencing posts, operational area (1 ha, but within the construction camp footprint), borrow pit (no more than 2 ha), water storage tanks and a deionization plants. **GPS co-ordinate of Corner A:** 30º 50' 12.2" S & 24º 19' 58.7" E **GPS co-ordinate of Corner B:** 30º 48' 48.5" S & 24º 21' 26.4" E **GPS co-ordinate of Corner C:** 30º 50' 12.6" S & 24º 23' 19.7" E **GPS co-ordinate of Corner D:** 30º 51' 07.4" S & 24º 21' 33.2" E

Section 24E of NEMA requires that every EA must ensure that adequate provision is made for the ongoing management and monitoring of impacts of the activity on the environment throughout the life cycle of the activity. The life cycle of the activity is determined by the scope of the activity. If the activity requires EA for development only, the development phase is the scope of the activity. If the activity requires EA for development and operation, the development and operational phases make up the scope of the activity (Environmental Authorisation Validity Period Explanatory Document, 2018). Only when the activity includes such an operational component, the relevant Scoping and Environmental Impact Assessment, the Environmental Authorisation (including any conditions thereto) and the EMPr can include aspects regarding the operation scope of the activity e.g., mitigation actions for the operational phase (Environmental Authorisation Validity Period Explanatory Document, 2018).

None of the listed and/or specified activities that are triggered, and which require environmental authorisation, specifically include the term '*and related operation*' (**Table 6**). Consequently, the scope of the activities pertaining to this project does not have an operational (or decommissioning) component.

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Description of Development Activities

All activities that are to be undertaken during the development of a 400 MW solar PV facility, have been described for the planning and design, pre-construction, construction, and post-construction phases only (**Table 7**). Pre-construction follows on from the final project planning and tender phase and leads up to the establishment of the appointed contractor on site.

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Table 7. A description of the activities to be undertaken during development, and the associated environmental aspects.

PHASES, ACTIVITIES, SERVICES & PRODUCTS ON PREFFERED FOOTPRINT	SUB-ACTIVITY	ENVIRONMENTAL ASPECT
Planning & Design		
LEGAL COMPLIANCE - Acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction and operation	Protected Species	NPNCA, 2009/NFA, 1998/NEMBA 2004
	Invasive Species	NEMBA, 2004
	Water Use S21(c) and (i)	NWA, 1998
	Water Use S21 (a)	NWA, 1998
	Water Use S21 (b)	NWA, 1998
	Water Use S21 (g)	NWA, 1998
	Water Use S21 (e)	NWA, 1998
	Mining (Borrow pit)	MPRDA, 2002
	Eskom 132kV servitude	Servitude Agreement and Letter of Consent
	Construction of the 20 m high 66 - 132 kV distribution line & 10-15m lightning mast	Civil Aviation Act (Act No. 13 of 2009)
	Development of substation infrastructure and distribution infrastructure	GN No. 435 of 22 March 2019 in terms of Section 24(5) of NEMA, 1998
	Development of a 400 MW Solar PV Facility	Astronomy Geographic Advantage (AGA) Act (Act No. 21 of 2007)
	Compliance Monitoring (ECO Appointment)	Environmental Authorisation

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CONSIDERATION OF ALTERNATIVES - including Location, Layout and Design, Magnitude, etc.	Alternative Sites	NA
	Alternative Technologies	NA
CLIMATE CHANGE	Solar PV Facility	
CHANGE LAND USE	Rezoning Land use application for a "special zone" or a "consent use" (temporary) submitted through the Emthanjeni LM for a decision by the District Municipal Planning Tribunal	SPLUMA and the Scheme Regulations, Spatial Development Framework of the Municipality and Development Principles (Section 7 of Act No. 16 of 2013)
		Conflict with surrounding land uses.
	Uncertainty (SIA)	Property values
		Fires
	Increased traffic on District Gravel Road during construction	Development of potholes, corrugations and puddles
	Land Acquisition and Access to Site	Physical and economic displacement of individuals and households.

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PLANNING	Commencement	
	Agreements	Eskom
	Labour	Job Creation
	Space	Magnitude of physical disturbance
LAYOUT & DESIGN	Lighting	
	Installing Perimeter Fence and Access Control	Security
		Terrestrial barrier
		Aquatic barrier
	Installing panel arrays and associated infrastructure (from racks to field transformers) ncluding within 100 m of a watercourse or 500 m of a wetland/pan	Physical Structures
		Atmospheric warming
		Shading
		Surface water hydrology (run-off)
		Interfering with ecological processes and biodiversity pattern
	Distribution Lines	Obstruction
	Water purification and storage.	
	On-site disposal facility	
	Water infrastructure	Taking groundwater during operation

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	Stormwater outlets	
	Access Roads	
	Ecological Buffers	Specialist Assessment Reports
	Flood lines	
	Building Plans	Municipal Bylaws
	Building Lines	Agriculture Zone 1
		Eskom servitude
Pre-construction		
Contractor Readiness	Awarding of preferred bidder	
	Acquiring permits, licenses, Letters of consent and permissions	**Permission:** No mechanical equipment shall be used in the vicinity of Eskom's apparatus and/or services without prior written permission having been granted by Eskom (Eskom letter dated 14 March 2017 ref: Invest14/03/2017)
		EMPr
		Other approvals
	Cultural Heritage Resource rescue and relocation	

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	Employment of labour	Influx of job-seekers and construction workers into the area.
	Development of Method Statements	
Site Establishment (Layout)	Site Selection	
	Site Area (size)	
	Perimeter/boundary fence	
	Site Offices	
	Lighting	
	Flammable and other hazardous substance stores	
	Crushing Plant	
	Laydown areas	
	Machinery Parking Area	
	Maintenance and workshop areas	
	Fuel storage and refuelling area	
	Vehicle wash bays	
	Sanitation/Ablutions	
	Pollution control	
	Eating/Rest Areas	
	Accommodation	
	Kitchen	
	Temporary access roads	

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	Sand washing plant	
	Batching plant/Cement-mixing area	
Construction		
Employee management (including appointment, conduct and movement)	Supervision	Avoid harm to the environment and persons
	Communicating	Noise generation
	Eating (lunch breaks)	organic and inorganic waste arisings
	Abluting	Land contamination
	Keeping warm or cooking	Starting fires
	Harvesting muthi plants, collecting firewood and/or poaching	Removal of medicinal plants, dead wood and/or wildlife
Construction Plant Management	Transporting	Generating dust
		Generating noise
		Speed (en route to & from site)
		Generating emissions
		Congestion for other road users
		Damage to the environment
	Operating equipment	Generating noise
	Operating equipment	Causing spills

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	Parking	Causing spills
	Parking	Damage to the environment
	Maintenance	Land contamination
	Maintenance	Watercourse contamination
	Washing plant	Land contamination
	Washing plant	Watercourse contamination
Water management (abstraction, storage and use)	Pumping from a borehole	Use of natural resources
	Installing a deionizing plant	
	Storage in tanks	Overflow and surface water run-off
	Sanitation and drinking	
	Dust suppression	Surface water run-off
	Mixing concrete on site	Addressed under 'Handling Hazardous Substances'
	Washing sand	Surface water run-off
General Waste Management	Handling and Collection (incl. chemical toilets)	Effluent discharges
		Land contamination
		Watercourse contamination
	Storage	Land contamination
		Watercourse contamination
		Unpleasant odours
	Transport	Land contamination
	Transport	Watercourse contamination
	Disposal	Land contamination

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	Disposal	Watercourse contamination
Handling Hazardous Substances	Fuel Storage	Land contamination
		Watercourse contamination
	Refuelling	Use of resources
		Causing spills
	Cement Storage	Land contamination
		Watercourse contamination
	Mixing concrete on site	Effluent (cement slurry) discharges and **land contamination**
		Effluent (cement slurry) discharges and **watercourse contamination**
		Waste arisings (cement bags)
	Transporting concrete	Land contamination
	Placing concrete	Watercourse contamination
	Waste Slurry and Concrete Storage and Disposal	Land contamination
		Watercourse contamination
	Disposal of Domestic Wastewater	Land contamination
		Watercourse contamination
		Unpleasant odours
	Paint Storage and Disposal	Land contamination
		Watercourse contamination
	Oil Storage and Disposal	Land contamination

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Alien Plant Management		Watercourse contamination
	Oil-contaminated water Storage and Disposal	Land contamination
		Watercourse contamination
	Contaminated Soil Storage and Disposal	Land contamination
		Watercourse contamination
	Damaged Solar panel and other e-waste Disposal	Land contamination
	Disturbance to natural areas	Favourable conditions for alien plant/animal recruitment.
STORMWATER MANAGEMENT AND EROSION CONTROL		
Chance Find Protocol		
Security		Influx of contractors and workers into the area.
Health and Safety		
Sourcing materials (aggregate) for roads and concrete	Use of natural resources	
	Importing aggregate	
	Use of local resources	
Crushing	Operation (and maintenance)	Dust generation
		Noise generation
		Soil contamination (hydrocarbon spills)

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ROAD MANAGEMENT Construction of permanent and temporary access roads (including upgrading existing roads and establishing new roads), As WELL AS maintenance of District gravel road	Driving a new two-track road including Fire-break road crossing potential watercourse crossings	Removal of vegetation and habitat
		Creating bare surfaces susceptible to erosion
	Grading existing and new roads including road crossings	Removal of vegetation and habitat
		Creating bare surfaces susceptible to erosion
	Installing culverts at existing road crossings	Watercourse contamination
	Importing material including road crossings	Dust generation
		Sedimentation of watercourse
	Shaping including road crossings	
	Compacting including road crossings	Noise generation
	Use including District gravel road, road crossings, etc.	Development of corrugations, potholes and puddles
Clearing/Grubbing and Grading	Construction camp (incl. operational area), borrow pit, upgrading existing and new roads, trenches for underground cables and water pipes, holes for racks, fence posts and pylons, foundations for inverters, field transformers and on-site	Removal of vegetation
		Noise generation
		Dust generation
		Creating bare surfaces susceptible to erosion
		Interfering with biodiversity patterns (fauna and flora)

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	substation, water storage tanks and deionization plant.	Destruction of artefacts
		Creating bare surfaces susceptible to alien invasive plant recruitment
	Clearing through watercourse crossings for perimeter fence (and firebreak road), underground cables and pipes, upgrading roads as well as **within proximity to a watercourse** for rack and fence posts, inverters and field transformers.	Sedimentation of watercourse
Drilling and/or Ram Piling (for rack foundations and fence poles)	Drilling Rig on land and in a watercourse (perimeter fence)	Noise generation
		Dust generation
		Mixing soil horizons
		Waste arisings (spoil)
		Traps
		Sedimentation of watercourse
		Vibration
		Soil contamination (hydrcarbon spills)
	Field transformers	
	Electrical circuits	

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Installing panel arrays and associated infrastructure (from racks to field transformers) including within 100 m of a watercourse or 500 m of a wetland/pan	Panels	Dripline
Earthworks - Borrow pit, holes for racks and fence posts, foundations for road crossing culverts, inverters, field transformers, on-site substation, pylons and operational area (building, on-site disposal facility) and trenches for underground cables and pipes, and water storage tanks and deionization plant.	Excavating including foundations and trenching through a watercourse	Disturb borrowing animals
		Dust generation
		Mixing soil horizons
		Sedimentation of watercourse
		Traps
		Create an unstable depression
		Alter surface water hydrology
		Alter visual landscape
		Waste arisings (spoil)
	Backfilling including through a watercourse	Dust generation
		Susidence (if not adequately compacted)
		Tunnel erosion (when using unsuitable bedding in sodic sites)
Stockpiling and Storing (Laydown)	Mulch, topsoil, aggregate, spoil and infrastructure	Cover fauna/nests/burrows
		Smother and damage flora
		Wind erosion & entrainment
		Impede river flow
		Sedimentation of watercourse
		Removal by runoff
	Topsoil	Viability of stockpiled material

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Erecting the 33kV powerline underneath Eskom's 133kV powerline	Relocation of existing services	Disruption in the provision of services
	Consultation with affected parties	Insufficient consultation
	Working near or under powerlines	Unsafe environment (damage to property and loss of life)
Post-construction		
Rehabilitation	Temporary structures and infrastructure	
	Pollution and Waste	Soil contamination (hydrocarbon spills)
	Borrow Pit	Surface water hydrology (run-off)
		Compaction
		Compromised topsoil
		Overgrazing
	Disturbed areas - terrestrial	Surface water hydrology (run-off)
		Compaction
		Compromised topsoil
		Overgrazing
	Disturbed areas - aquatic	Reshaped bed and banks
		Compromised topsoil
		Overgrazing
Maintenance and Monitoring		Erosion

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		Water Quality Compromised topsoil
		Revegetation
		Alien plant recruitment

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SECTION E: DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT

2(1) A scoping report… must include –

- *a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

List of Applicable Legislation and Other Documents

The following legislation, guidelines, departmental policies, environmental management instruments and/or other decision-making instruments that have been developed or adopted by a competent authority in respect of activities associated with a development of this nature, were identified and considered in the preparation of this S&EIA process.

1. Astronomy Geographic Advantage (AGA) Act (Act No. 21 of 2007);
2. Civil Aviation Act, 2009 (Act No. 13 of 2009);
3. Conservation of Agricultural Resources Act (Act No 43 of 1983);
4. DEA (2010), Guideline on Need and Desirability, Integrated Management Guideline Series 9, Department of Environmental Affairs (DEA), Pretoria, South Africa;
5. DEA (2010), Public Participation 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs, Pretoria, South Africa;
6. DEA (2011), National list of ecosystems that are threatened and in need of protection. GN 1002, GG 34809, 9 December 2011;
7. DEA (2019), Notice of Identification, in terms of Section 24(5) of the National Environmental Management Act, 1998, of a Generic Environmental Management Programme relevant to an application for Substation and Overhead Electricity Transmission and Distribution Infrastructure in GN No. 435 published in Government Gazette No. 42323;
8. DEA&DP (2010), Guideline on Alternatives, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP);
9. DEAT (2002), Specialist Studies, Information Series 4, Department of Environmental Affairs and Tourism (DEAT), Pretoria;
10. DWAS (2016), General Authorisation in GN No. 509 published in Government Gazette No. 40229 dated 26 August 2016;
11. DWA (2007), Guideline for Developments within a Flood line (Edition 1), Department of Water Affairs and Forestry, Pretoria, South Africa;
12. DWAS (2016), General Authorisation in GN No. 538 published in Government Gazette No. 40243 dated 2 September, 2016;
13. Electricity Act, 1987 (Act No. 41 of 1987), as amended in 1994);
14. Emthanjeni Local Municipality, 2007 Spatial Development Framework;
15. Environment Conservation Act (No 73 of 1989), including Schedules 4 and 5 of the National Regulations regarding Noise Control made under Section 25 of the Environment Conservation Act, 1989 (Act 73 of 1989) in GN No. R 154 of Government Gazette No. 13717 dated 10 January 1992.

(Note that this particular section of the Environment Conservation Act is not repealed by NEMA (107 of 1998)). Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);

16. Generic Environmental Management Programme for Substation and Overhead Electricity Transmission and Distribution Infrastructure published in Government Notice No. R. 435 in Government Gazette No. 42323 of 22 March 2019;
17. IDP (Final) 2021 – 2022, Emthanjeni Local Municipality;
18. Minerals and Petroleum Resources Development Act, 2002 (Act No 28 of 2002);
19. National Environmental Management Act, 1998 (No 107 of 1998) including EIA Regulations, 2014 (as amended) published in Government Notice No. R. 326, R. 327, R. 325, and R. 324 in Government Gazette No. 40772 of 07 April 2017;
20. Generic Environmental Management Programme for Substation and Overhead Electricity Transmission and Distribution Infrastructure published in Government Notice No. R. 435 in Government Gazette No. 42323 of 22 March 2019;
21. National Environmental Management: Air Quality Act, 2003 (Act No 57 of 2003) including the list of activities which result in atmospheric emissions published in GN No. 248 of Government Gazette No. 33064 dated 31 March 2010;
22. National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004);
23. National Environmental Management: Biodiversity Act: Alien and Invasive Species Regulations lists published in Government Gazette 43735, Notice 1020 of 25 September 2020;
24. National Environmental Management Protected Areas Act (Act No. 57 of 2003);
25. National Environmental Management: Waste Act, 2009 (Act No. 59 of 2009) (“NEM:WA”);
26. National Forest Act, 1998 (No 84 of 1998);
27. National Heritage Resources Act, 1999 (Act No 25 of 1999);
28. National Veld and Forest Fire Act, 1998 (Act No 101 of 1998);
29. National Water Act, 1998 (Act No. 36 of 1998);
30. National Building Regulations and Building Standards (Act No. 103 of 1977);
31. National Fencing Act (Act No.31 of 1963) and the Fencing Amendment Act (Act No. 3 of 1971);
32. Northern Cape Provincial Growth and Development Strategy (2004-2014);
33. Northern Cape Strategic Plan (2020 – 2025);
34. Northern Cape Climate Change Adaptation Response Strategy (2016);
35. Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009);
36. Pixley Ka Seme District Municipality, Spatial Development Framework (2013 – 2018).

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Legislative Context of the Proposed Activity

A review of the relevant legislation, policies and documents pertaining to the energy sector indicate that solar energy and the establishment of photovoltaic power plants are supported at a national, provincial and local level.

International policy and legislative context

The Convention on Biological Diversity (CBD)

This is an international agreement adopted at the Earth Summit, in Rio de Janeiro, in 1992. It has three main objectives:

- to conserve biological diversity;
- to use its components in a sustainable way; and
- to share fairly and equitably the benefits arising from the use of genetic resources.

The CBD was discussed under the guidance of the United Nations. It was signed by more than 150 government leaders at the Rio Earth Summit, amongst which South Africa is a signatory. The convention highlights the need to apply the precautionary principle "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

The Paris Agreement

This Agreement builds upon the United Nations Framework Convention on Climate Change (UNFCCC) to promote greenhouse-gas-emissions reduction and adaptation to climate change, starting in the year 2020. Its main objective is to strengthen the ability of countries to deal with the impacts of climate change, with greater support to assist developing countries to do so. The Paris Agreement brings all nations into a collective cause to keep a global temperature rise to less than 1.5 degrees Celsius above pre-industrial levels through nationally determined contributions (NDCs). South Africa is one of the 194 states who have signed the Agreement with a percentage of greenhouse gases for ratification of 1.46%. The goals of the Paris Agreement are being incorporated into national agendas and several initiatives are being created such as the Least Developed Countries Renewable Energy and Energy Efficiency Initiative for Sustainable Development (LDC REEEI) which aims to:

- bring sustainable, renewable and clean energy to least developed countries;
- improve energy access;
- promote skill development and creation of jobs; and
- contribute to the achievement of the Sustainable Development Goals.

National policy and legislative context

Constitution of the Republic of South Africa (Act No. 108 of 1996)

Provides the legal framework for the regulation of environmental management activities in South Africa, especially Section 24 which states that the people of South Africa have the right to an environment that is not harmful to their health or well-being and makes it the duty of the State to control ecologically sustainable infrastructure development and use of natural resources while promoting reasonable economic and social development.

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National Environmental Management Act (NEMA) (Act No. 107 of 1998)

Promotes the integrated environmental management of activities that may have a significant effect (positive or negative) on the environment. Section 24(1) of the NEMA states that "in order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorization." The reference to "listed activities" in Section 24 of the NEMA relates to the NEMA: EIA Regulations and its amendments.

NEMA: Environmental Impact Assessment (EIA) Regulations

Requires that an environmental authorisation is obtained before activities, which have been listed in terms of NEMA, are commenced with. The Minister of Environmental Affairs has on the 07th April 2017, published amendments to the NEMA: EIA Regulations of 2014 Government Notices Regulation (GNR) 326 and the three Listing Notices GNR 324, GNR 325 and GNR 327. Where an applicant proposes to undertake one of the listed activities contained in the three Listing Notices GNR 324, GNR 325 and GNR 327; a basic assessment (BA) or a S&EIR process is required. To apply for an Environmental Authorisation for the proposed 400 MW solar PV facility, a full S&EIR process is required. The potential impact of the proposed activities on the environment must be considered, investigated, assessed and reported to the competent authority.

The Competent Authority (CA) would normally be the Provincial Environmental Department, in this case the Department of Environment and Nature Conservation (DENC) in the Northern Cape Province. However, the Department of Environment and Nature Conservation in Kimberley, has requested the National Department of Forestry, Fisheries and Environment (DFFE) to act as the CA for dealing with this application, and excuse DENC of their responsibility to act as the CA on the grounds of currently being under resourced to handle an application of this nature **(refer to Section K)**.

National Environmental Management: Waste Act (NEMWA) (Act No. 59 of 2008)

This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. The Act also provides for the licensing and control of waste management activities through GNR. 921 (2013 as amended 2022): List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment.

The proposed solar PV facility does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921.

However, the contents of the Environmental Management Programme (EMPr) will include reasonable measures for the prevention of pollution and waste management.

National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004)

Provides for "the management and conservation of South Africa's biodiversity within the framework of the NEMA", including avoidance and mitigation of loss of biodiversity through habitat loss, degradation or fragmentation; eradication and prevention of invasive species, biodiversity offsets. NEMBA also prescribes what must be done when a development overlaps with one of the 225 threatened

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ecosystems listed in the Act. Based on the EIA process and specialist assessments undertaken for the proposed site, none of the threatened ecosystems occur within the proposed site area.

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants will be included in the Environmental Management Programme (EMPr).

National Environmental Management Protected Areas Act (NEMPAA) (Act No. 57 of 2003)

The purpose of the National Environmental Management Protected Areas Act (Act No. 57 of 2003) (NEMPAA) is to, inter alia, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas.

According to the National Protected Area Expansion Strategy (NPAES), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area.

National Forest Act (NFA) (Act No. 84 of 1998)

Provides the list of protected trees for which a license is required for any removal, cutting, disturbance, damage to or destruction of any of the listed protected trees. The presence of any of these species within the final development layout will be determined during the implementation of the plant rescue and protection plan as per the EMPr.

National Heritage Resources Act (NWA) (Act No. 25 of 1999)

This Act sets out requirements for site assessment and specialist reporting to ensure the protection and appropriate management of heritage resources in South Africa. The Act provides details on the permits required for any activities which may have an impact on heritage resources and more specifically:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old;
- Section 36: graves and human remain older than 60 years and located outside of a formal cemetery administered by a local authority.

Depending on the type of permits required, the application must be submitted to the South African Heritage Resources Agency (SAHRA) and/or the provincial heritage resources authority of the Northern Cape: Ngwao-Boswa Ya Kapa Bokoni.

A Cultural Heritage Impact Assessment and a Palaeontological Impact Assessment will be undertaken during the S&EIR to identify and assess any potential impact on heritage resources. Ngwao- Boswa Ya Kapa Bokoni and the SAHRA is being consulted during the S&EIR and invited to provide comment on the proposed project. The heritage specialist and palaeontological specialist reports compiled for the proposed development will be uploaded into the project folder created on the South African Heritage Resources Information System (SAHRIS) for the proposed project. SAHRIS case number is 17965.

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National Water Act (NWA) (Act No. 36 of 1998)

This Act aims to ensure the protection of aquatic ecosystems and sets out general principles for the regulation of water use. Section 21 of the NWA identifies certain activities, water supply/demand and waste disposal as 'water uses' which require authorisation (licensing) by the Department of Water and Sanitation (DWS). A water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. According to section 21 of the Act, the following water uses must be licensed:

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

The Section 21 water uses associated with the proposed development are as follows:

(a) - taking water from a water resource
(b) - storing of water
(c) - impeding or diverting the flow of water in a watercourse.
(g) - disposing of waste in a manner which may detrimentally impact on a water resource
(i) - altering the bed, banks, course, or characteristics of a watercourse.

The DWS will make the final decision on water uses that are applicable to the project through a pre-application meeting after which a Water Use License Application (WULA) as determined by the risk assessment will be undertaken in compliance with procedural regulations.

Astronomy Geographic Advantage Act (AGA) (Act No. 21 of 2007)

Aims to protect astronomy in all its forms in South Africa, specifically but not limited to the MeerKAT and SKA projects in the Northern Cape Province. The AGA Act regulates the identification and protection of areas in which astronomy projects can be undertaken as well as the undertaking of activities which cause or could cause Radio Frequency Interference (RFI) to astronomical activities in these areas. The AGA Act is legislation that gives the Minister of Science and Technology the power to protect areas, through regulations, that are of strategic national importance for astronomy and related scientific activities. Such area is declared as an Astronomy Advantage Area (AAA).

To ensure protection of the SKA project, the government had to pass a law to protect areas suitable for astronomy studies by, among others, regulating radio and electrical interference: the Astronomy

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Geographic Advantage (AGA) Act of 2007. The AGA Act and associated regulations have implications for people living within an Astronomy Advantage Area (AAA).

The South African Radio Astronomy Observatory (SARAO), a facility of the National Research Foundation, is responsible for managing all radio astronomy initiatives and facilities in South Africa.

Should the facility be located within the Karoo Central Astronomy Advantage Area (KCAAA), it will be subject to the requirements of the AGA Act, and the relevant regulations governing the protection of the KCAAA.

The site area does not fall within an Astronomy Advantage Area (AAA) under the Astronomy Geographic Advantage (AGA) Act (Act No. 21 of 2007). The letter from SARAO dated 16 March 2022 states *"SARAO has undertaken a high-level impact assessment and based on the information provided it was determined that the project represents a low risk of interference to the SKA radio telescope with a compliance surplus of 57.02 dBm/Hz. As such, we do not have any objection to the proposed development."* ***(*Annexure E of the PPP Report attached as Appendix C)**

Civil Aviation Act (Act No. 13 of 2009)

Provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. In South Africa all structures higher than 15 m above ground level must be assessed and registered as potential obstacles to aviation in the Electronic Terrain and Obstacle Database (eTOD). The Obstacle Evaluation Committee (OEC) which is made up of members from both the SA CAA and South African Air Force (SAAF) fulfils the role of streamlining and coordinating the assessment and approvals of proposed developments or activities that have the potential to affect civil aviation, military aviation, or military areas of interest. With both being national and international priorities, the OEC is responsible for facilitating the coexistence of aviation and renewable energy development, without compromising aviation safety.

As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their obligation would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments.

The DEA Screening Tool Report identified Civil Aviation as having low sensitivity for the proposed solar PV facility. Nonetheless. ATNS and SACAA have been added as an Interested and Affected Party. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.

Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002)

Specifies that mineral and petroleum resources are the common heritage of all the people of South Africa and that the state is the custodian thereof for the benefit of all South Africans. In terms of Section 53 of the MPRDA the approval of the Department of Minerals and Resources (DMR) Minister is thus required for any land surface use that may be contrary to the objectives of the MPRDA. A Section 53 application is required for all land uses other than those proposed within an area with an already approved town planning scheme, farming related land uses, or other land uses identified by the Minister as not requiring approval.

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With a project lifecycle of at least 20 years and the likelihood of upgrade at the end of the operation phase, the Solar PV facility is considered to have the potential for temporarily preventing access to below ground mineral resources and may require approval in terms of Section 53 of the MPRDA. The DMR has been included as a registered Interested and Affected Party in this S&EIA.

National Energy Act, 2008

One of the objectives of the National Energy Act, 2008 (No. 34 of 2008) is to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar (see extract below).

"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 …"

Electricity Regulation Act, 2006 (Act No. 4 of 2006)

The Act's objective is to provide for control over the generation and supply of electricity, as well as the existence of NERSA and other related matters. The issuing of licences, determination of process, settling disputes, collecting information are the functions of NERSA.

Occupational Health and Safety Act (Act No. 85 of 1993)

The National Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed solar PV facility. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations is essential.

Policies and Plans

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

This paper identifies the need for demand side management and the development and promotion of energy efficiency in South Africa. It requires energy policies to consider 'energy efficiency and energy conservation' within the Integrated Resource Planning (IRP) framework from both supply and demand side in meeting energy service needs;

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, such as the proposed De Aar Solar One Photovoltaic Power Project. These renewable applications are in fact in most cases the most cost effective; 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;

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- 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 White Paper also acknowledges that South Africa has neglected the development and implementation of renewable energy applications. The White Paper also notes that renewable energy applications have specific characteristics that need to be considered.

Advantages include:

- There are less environmental impacts in operation compared with traditional supply technologies; and
- Generally high labour intensities and lower running costs.

Disadvantages include:

- Higher capital costs in some cases;
- Lower energy densities; and
- Depending on specific conditions, especially with sun and wind based systems, provide lower levels of availability.

Integrated Energy Plan (2003)

The development of a National IEP was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette.

The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development.

The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, improve supply bottlenecks and supply-demand deficits. In addition, it is important that all citizens are provided with clean and modern forms of energy at an inexpensive price.

National Development Plan 2030

The National Development Plan aims to eliminate poverty and reduce inequality by 2030. The NDP identifies a number of supporting milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just necessary for faster economic growth and higher employment.

Chapter 3, Economy and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges.

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Integrated Resource Plan 2010 – 2030

The Integrated Resource Plan (IRP) 2010-30 was promulgated in March 2011. It was indicated at the time that the IRP should be a "living plan" which would be revised by the Department of Energy (DoE) every two years. Since the promulgation of the Integrated Resource Plan (IRP) 2010-30 there have been a number of developments in the energy sector in South and Southern Africa. In addition, the electricity demand outlook has changed markedly from that expected in 2010. The objective of the IRP 2010 is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next 25 years. The IRP 2010 is intended to, *inter alia*, consider environmental and other externality impacts and the effect of renewable energy technologies. The IRP 2010 further aims to:

- allocate 43% of new energy generation facilities in South Africa to renewables;
- allow for an additional 14 749 MW of renewable energy in the electricity blend in South Africa by 2030;
- an accelerated roll-out of renewable energy options to derive the benefits of localisation in these technologies.

While there are a number of renewable energy options (including, *inter alia*, wind, solar and hydropower) being pursued in South Africa, many more renewable energy projects are required to meet the targets set by the IRP 2010. With regards to photovoltaic solar energy the IRP 2010 expresses the need for firm commitment to this sector in order to facilitate the connection of the first units to the grid in 2012. It also identifies the need to provide security of investment in order to ramp up a sustainable local industry cluster.

Renewable Energy Feed-in Tariff

The NERSA 'Renewable Energy Feed-in Tariff'' (REFIT) guidelines were published in 2009 under the Electricity Regulation Act (Act of No. 4 of 2006) pledging attractive rates of payment for renewable energy sold back to the grid. An innovative initiative to encourage investment within the sector of renewable energy and to help achieve the national renewable energy targets.

The REFIT programme includes a number of phases as follows;

- Phase 1: Including quotas for wind, small hydro, landfill gas and Concentrated Solar Power (CSP);
- Phase 2: Including quotas for Solar though without storage and central tower, additional CSP and photovoltaic systems including large ground or roof based and concentrating photovoltaic (CPV), as well as biomass solid and biogas technologies.

Provincial policy and legislative context

Northern Cape Nature Conservation Act (Act No. 9 of 2009)

Includes a list of protected flora and associated requirements for the issuing of permits and other authorisations. A permit for the clearance of indigenous vegetation on site as well as for relocation or destruction of any listed protected flora species under the Act will be required if any of the identified protected plant species are impacted by the proposed development.

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A detailed plant search and rescue operation will be conducted prior to the commencement of the construction phase to record the position of the protected plant species and inform the required applications. In addition, if there are any nationally protected trees within the development footprint a destruction permit from the Department of Environment, Forestry and Fisheries would also be required.

Northern Cape Provincial Growth and Development Strategy (2004-2014)

At a provincial level the Northern Cape Provincial Growth and Development Strategy (NCPGDS) makes reference for the need to ensure the availability of inexpensive energy for the Northern Cape. The NCPGDS notes;

"*the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape*".

The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised. The NCPGDS also highlights the importance of enterprise development and noted that current levels of private sector development and investment in the Northern Cape are low. It also noted that the Northern Cape lags in the key policy priority areas of small, medium and micro enterprise (SMME) development and Black Economic Empowerment. The proposed project has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape.

Northern Cape Strategic Plan (2020-2025)

The Northern Cape Strategic Plan (2020 -2025) identifies the province as one of the best sites in the world to produce solar renewable energy and that this potential has attracted to the province a large number of investors who are developing their CSP and PV plants under the DoE's Renewable Energy Independent Power Producer Procurement Programme (RE IPP). The new vision of the Province is "A Modern, Growing and Successful Province".

Northern Cape Climate Response Strategy

The Northern Cape Government is in the process of finalising a Provincial Climate Change Response Strategy. The key aspects of this strategy are, however, summarised in the MEC's (Northern Cape Provincial Government: Environment and Nature Conservation) 2011 budget speech. These are;

- commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010);
- an acknowledgement of the Northern Cape Province's extreme vulnerability to climate-change driven desertification.

The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly identified as an important element of the Provincial Climate Change Response Strategy.

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Northern Cape Provincial Spatial Development Framework (2013 - 2018)

The Northern Cape Provincial Spatial Development Framework (2011) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The Provincial Spatial Development Framework further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province.

The Provincial Spatial Development Framework also notes that the tourism sector is identified as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed project; do not affect the tourism potential of the Province.

Pixley ka Seme District Municipality Integrated Development Plan (IDP) (2017-2022)

According to the Pixley ka Seme District Municipality IDP, solar and wind farms have been identified as renewable energy opportunities for the District in terms of the SWOT analysis. The growth and development context in the district has also changed radically since 2013 (after it had been stagnant for decades) owing mainly to private and public investments in the area as a hub for renewable energy generation and astronomy, respectively.

Section 4 of the IDP highlights the districts development strategies for period 2017 – 2022. In terms of local economic development (Economic Infrastructure) it is the municipalities strategic objective to:

- The proportion of people with access to the electricity grid should rise to at least 90% by 2030, with non-grid options available for the rest;
- Promote economic growth in the district; and
- Monitor and support local municipalities to enhance service delivery.

In terms of Environmental Sustainability and resilience, the district aims for:

a. At least 20 000MW of renewable energy contracted by 2030 – 8 years' time.

Emthanjeni Local Municipality IDP 2021/2022 (09 June 2021)

Emthanjeni has in recent time seen the influx of investment in Renewable energy projects and is a potential industrial growth point with ample industrial sites, reasonable prices and tariffs, affordable labour and the necessary infrastructure. The Emthanjeni Local Municipal Integrated Development Plan indicates that energy consumption will potentially increase by 10% and a similar strategy for alternative energy will have to be identified for both cooling in summer and heat in winter. The alternative of solar energy will be needed to relieve electricity.

The Municipality is convinced that the Renewable Energy projects, New District Hospital and possibility of new Warehouse Hub and Manufacturing project for further development planned for the area would grow the economy enormously.

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Emthanjeni Municipality Spatial Development Framework (SDF) 2007

It is the intention of the SDF to arrange development activities and the built environment in such a way and manner that it can accommodate and implement ideas and desires of people without compromising the natural environment.

The towns of Emthanjeni lie in an extensive stock farming area with the emphasis on sheep, mutton and wool farming, especially Merino's. It is proposed that the agricultural sector be retained as it is at present to ensure that it still plays an economic part in the future of the Municipal area. Tourism possibilities must be explored and developed to broaden the economic base of these areas.

As mentioned, the current land use is sheep farming, which will continue within the solar PV facility to ensure minimal reduction (if any) on the agricultural potential of the land.

District Renewable Energy Hub

The District Renewable Energy Hub Draft Conceptual Document (26 February 2010) drafted by the Local Economic Development Division of the Pixley ka Seme District Municipality has proposed that the areas around the northern and eastern borders of the Pixley Ka Seme District Municipality, with a distance of 50 kilometres from the Orange River, forms part of this hub. The hub has the potential to stimulate special economic development zoned within the area and industrial development.

The draft concept document outlines the proposed strategy, which is in line with both the National and Provincial policy with respect to renewable energy generation.

The Renewable Energy Hub is seen as a critical component to the revitalisation of both the broader District and the town of De Aar. The District is well positioned for renewable energy development (including solar, wind, biomass and hydro-electric) due to the ample availability of suitable land, the existence of adequate existing infrastructure.

It is envisaged that the Hub will:

- attract both local and foreign investors and research institutions;
- alleviate the increasing demand on electricity nationally;
- reduce South Africa's dependence on fossil fuel;
- create employment and downstream business opportunities for local entrepreneurs; and

utilise the high insolation rates and steady winds.

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SECTION F: MOTIVATION FOR THE NEED AND DESIRABILITY FOR THE PROPOSED ACTIVITY

2(1) A scoping report… must include –

(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Note: As the Guideline on Need and Desirability (2017) has not yet been published in a Government Gazette (date of commencement is unclear) hence the Guideline on Need and Desirability (2010) has been used.

Legislative Background and Strategic Context

National Environmental Management Principles of NEMA, 1998, which guide the interpretation, administration and implementation of NEMA, 1998 (and the EIA Regulations, 2014) specifically require *inter alia* that environmental management must place people and their needs at the forefront of its concern (Section 2(2)). The latter refers to the broader societal/community needs and interests, and is put into effect through the EIA Regulations, 2014, which require environmental impact assessments to specifically consider 'need and desirability' in order to ensure that the 'best practicable environmental option' is pursued, and that development more equitably serves broader societal needs now and in the future. Furthermore, it ensures that the proposed actions of individuals are measured against the long-term public interest.

What is needed and desired for a specific area must be strategically and democratically determined (DEA&DP (2010) Guideline on Need and Desirability). The strategic context for informing need and desirability is best addressed and determined during the formulation of the sustainable development vision, goals and objectives of Integrated Development Plans ('IDPs') and Spatial Development Frameworks ('SDFs') during which collaborative and participative processes play an integral part, and are given effect to, in the democratic processes at local government level (DEA&DP (2010) Guideline on Need and Desirability). The need and desirability must therefore be measured against the contents of the credible IDP, SDF and EMF (**no adopted EMF for the development site**) for the area, and the sustainable development vision, goals and objectives formulated in, as well as the desired spatial form and pattern of land use reflected in, the area's IDP and SDF (DEA&DP (2010) Guideline on Need and Desirability). Integrated Development Planning (and the SDF process) effectively maps the desired route and destination, whilst the project-level EIA decision-making finds the alternative that will achieve the desired goal (DEA&DP (2010) Guideline on Need and Desirability). However, inadequate planning or the absence of a credible IDP and SDF means that the EIA has to address the broader need and desirability considerations. Consequently, 'need and desirability' is determined by considering the broader community's needs and interests as reflected in a credible IDP, SDF and EMF for the area, and as determined in the EIA decision-making process.

Furthermore, the Constitution calls for *justifiable* economic development. The specific needs of the broader community must therefore be considered together with the opportunity costs and distributional consequences in order to determine whether or not the development is 'justified'.

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The general meaning of need and desirability refers to time and place, respectively, e.g., is this the right time and is it the right place for locating the proposed activity. The need and desirability of this application was addressed separately and in detail by answering *inter alia* the following questions.

The answers to the questions below will form key informants to the identification and consideration of alternatives, including the option not to proceed with the development.

Need ('timing')

Question 1:

Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (e.g., is the proposed development in line with the projects and programmes identified as priorities within the credible IDP).

Explanation:

Question 1 and 2 seeks to find clarity as to whether the proposed land use is catered for in the current planning framework of the SDF and is intended for at that specific point in time. In this context the term land use should not only be broadly defined as agriculture, residential or industrial use, etcetera., but where relevant, it must be further qualified, for example, stating specifically whether a housing development is for social or high-income purposes, or whether the industrial use is for service industries, or heavy industry, or whether the development is a high-rise as opposed to low-rise development, etcetera. Furthermore, if the land use is to occur in the proximity of an urban area, clarity must also be provided regarding its location in relation to the urban area.

- Yes. The proposed project would contribute to the economic stability of the area by establishing a sustainable industry on a property that has low agricultural potential.
- At a provincial level, the Northern Cape Provincial Spatial Development Framework (PSDF, see Section 1.5.2.8) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The PSDF further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province.
- The Northern Cape Provincial Growth and Development Strategy (NCPGDS) (see Section 1.5.2.5) states that the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes that the development of energy sources such as solar energy could be a means by which new economic opportunity and activity is generated in the Northern Cape. The NCPGDS also highlights the importance of close co-operation between the public and private sectors for the economic development potential of the Northern Cape to be realised.
- The ELM IDP lists a number of industrial and manufacturing projects that form part of the larger strategy for the economic development of the municipality. One of these projects includes the establishment of De Aar as a Renewable Energy Hub. Basic service delivery, with energy as one of the priority issues, micro- and macro-economic development as well as land use management

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have been highlighted as key performance areas to be addressed within the ELM. The establishment of the proposed photovoltaic power plant has the potential to support a number of key strategies in the ELM IDP.

- The proposed project will create up to 650 employment opportunities (mainly unskilled and semi-skilled) during the construction phase and up to 55 during the operational phase. A large number of the workforce would be sourced from the surrounding areas. Specific training would also be provided for more technical tasks.

Question 2:

Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?

- Yes, the ELM IDP recognises the need for economic growth and the creation of employment opportunities for local people;
- The N10 has been identified as a central part of the energy hub;
- The project list is incorporated in the IDP based on the needs of the community. The critical areas remain Infrastructure and Local Economic Development. Within the limited resources of the Municipality, it will have to address the following;
    - Roads
    - Storm water
    - Housing delivery (servicing of sites)
    - Bulk services (**electricity**, water)
    - Support to SMME's
    - Sewerage.

Question 3:

Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g., development is a national priority, but within a specific local context it could be inappropriate).

Explanation:

Question 3 *relates to the type of development and land use and not just its associated benefits or costs (e.g., the specific needs of the community at that specific time, e.g., small business rather than shopping centres, low-cost housing rather than luxury housing, etcetera, must be considered).*

- Yes, the area has an unemployment rate of 28% (Census 2011 data) and the site is marginal for profitable agricultural activities. The proposed project would create a relatively large number of temporary and permanent (over the lifespan of the project) employment opportunities for the local De Aar/Hanover communities. The area around De Aar has also been identified as a Renewable Energy Hub in the ELM IDP.
- The Municipality has agreed on seven (7) Strategic Objectives that are to be achieved.

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1) Basic Services and Infrastructure Development
2) Institutional Development and Municipal Transformation
3) Good Governance and Public Participation
4) Financial Viability
5) Local Economic Development
6) Safety and Security
7) Social Development

- The policy case for the roll-out of renewable energy in South Africa has been made at a national and provincial government level using arguments that are in line with international policy trends. Targets that include solar energy have been set and incentives have been offered to renewable energy developers through the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) to encourage projects. Aside from impacts on the achievement of national goals and policy imperatives, the project also has the potential to contribute to greater energy supply stability and security in the province and local area to the benefit of local residential electricity consumers as well as farmers and businesses.
- As indicated in the EML IDP, Emthanjeni has in recent time seen the influx of investment in Renewable energy projects and is a potential industrial growth point with ample industrial sites, reasonable prices and tariffs, affordable labour and the necessary infrastructure. Further, the Emthanjeni Local Municipal Integrated Development Plan, indicates that energy consumption will potentially increase by 10% and a similar strategy for alternative energy will have to be identified for both cooling in summer and heat in winter. The alternative of solar energy will be needed to relieve electricity.

Question 4:

Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?

Explanation (Question 4 and 5):

According to the NEMA EIA Regulations, an EIA must contain a description and assessment of the significance of any environmental impacts, including cumulative impacts, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the activity. An associated activity/component essential for the undertaking of a proposed development (i.e. any associated component of the development, which cannot be separated from the development itself; e.g. residential development that cannot exist without the essential municipal infrastructure to serve it in terms of water and electricity provision, waste removal, treatment of sewage and management of stormwater) must be considered together with the proposed development, before the environmental authority decides on the development application. The environmental authority must (be able to) apply its mind to all the impacts (of the development and all its associated activities/components) prior to decision-making. Deferring decision-making on associated components to a future date constitutes conditional and piecemeal (incremental) decision-making, which result in the environmental authority not applying its mind to all the impacts and the pre-empting of decisions on the associated components-resulting in unsustainable development and legally impermissible administrative action.

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- Yes.
- Electricity would be obtained from Eskom via the existing supply to the site. The proposed project would strengthen the local electricity grid for the area and thus improve the available electrical services.
- In terms of water requirements, the proposed project would utilise groundwater from existing and/or new boreholes on the property. Rainwater harvesting from operation area office roof is also suggested.
- All general waste would be disposed of at the De Aar licensed landfill site.
- The principal sanitation system during construction shall be a sewerage treatment package plant (**S21(g)**). Black water (flush toilet sewerage) and grey water (from hand wash basins) will be treated in a decentralised toilet block treatment system known as NEWGen100. NewGen100 is a compact containerised treatment unit that treats and recycles >99% of the flush toilet sewage from multiuser toilet blocks. The system is an autonomous, solar-powered, compact, and off-grid sewage treatment system which utilizes membrane biotechnology for the treatment of sewage from toilets for re-use in the toilets. A sub-surface soakaway will be required to dispose of the 'unrecycled' or excess treated effluent that cannot be reused for dust control/suppression.
- The NewGen100 sanitation system will be supplemented by portable chemical toilets for use by the work front further away from the construction camp.
- The principal sanitation system during operation shall be a sewerage treatment package plant (S21(g)). Black water (flush toilet sewerage) and grey water (hand wash basins in kitchen, change rooms, medical room, and/or workshop) shall be treated to general limits with a Biorock package plant, specifically the Multirock 60 treatment system. Biorock products are capable of recycling domestic sewerage to produce a high-quality final product fit for irrigation or to return safely to the local receiving environment. A sub-surface soakaway will be required to dispose of the treated and disinfected effluent that cannot be reused for dust control/suppression.

Question 5:

Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?

- Yes.
- The District Municipality has proactively diversified its economy away from mining and agriculture through innovative local economic development initiatives, declaring themselves as a Renewable Energy Hub, seeking to attract foreign direct investment into solar, wind, hydro and biomass projects.
- Further, the Emthanjeni SDF proposes that the agricultural sector be retained as it is at present to ensure that it still plays an economic part in the future of the Municipal area. As mentioned, the current land use is sheep farming, which will continue within the solar PV facility to ensure minimal reduction (if any) on the agricultural potential of the land.

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Question 6:

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

Explanation (Question 6):

While the legislative frameworks require that national, provincial and municipal plans should be aligned, it is acknowledged that there might be certain strategically important developments (e.g. the construction of a nuclear power station) that are part of strategic programmes that are not always catered for in current planning framework of the SDFs. In these instances, the strategic need and desirability considerations must be measured against the needs and desires of the area in question when determining the need and desirability of the development under consideration.

- Yes.
- The proposed project would strengthen the local electricity grid for the area and contribute to meeting the national renewable energy targets set by the Department of Energy (DoE).

Desirability ('placing')

Question 7:

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

Explanation (Question 7):

According to NEMA the "best practicable environmental option" means the option that provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term. In determining the best practicable environmental option, adequate consideration must also be given to opportunity costs.

- Yes.
- The location factors are favourable for the development of a Solar PV facility including high and good quality solar irradiation, flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines to feed into the grid and the N10 for transport links.
- The prevailing unfavourable climatic conditions for arable agriculture, as well as the prevalence of soils with limited depth, the farm does not have a high agricultural potential.
- Furthermore, the proposed project plans to integrate with the current small livestock practices, increasing the profitability and optimises the opportunity costs of the property. While the solar PV farm will result in environmental impacts through disturbance to in situ vegetation, in the medium to long-term, it is possible that due to the creation of microclimates created beneath the solar panel arrays, a higher nett primary production may result, effectively increasing the grazing capacity of the land. This aspect will be quantitatively monitored through an ecological management plan.

Question 8:

Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities?

Explanation (Question 8 and 9):

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If the development is to occur in the proximity of an urban area, clarity must also be provided whether or not it will be situated within or outside of the urban area, with the impacts associated with its location in relation to the urban area to be specifically considered and reported on.

- No.
- The proposed project is in line with the initiatives of the Emthanjeni IDP to support economic growth, create job opportunities for local communities and establish De Aar as a Renewable Energy Hub.
- Further, the Emthanjeni IDP, indicates that energy consumption will potentially increase by 10% and a similar strategy for alternative energy will have to be identified for both cooling in summer and heat in winter. The alternative of solar energy will be needed to relieve electricity.

Question 9:

Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g., as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?

- No.
- The Emthanjeni Local Municipality does not have an EMF in place, and sensitivity analyses have been undertaken according to National Biodiversity Planning datasets, and the proposed properties are not deemed as critical biodiversity areas or national protected area expansion strategy areas.
- The properties are however identified as Ecological Support Areas (ESA) in terms of the Northern Cape CBA Map 2016 due to the presence of NFEPA wetlands, an Important Bird Area and vegetation types.
- Terrestrial Biodiversity, Aquatic Biodiversity, Avifauna, Bat, Animal Species and Plant Species specialist's studies will be undertaken during the Scoping and EIA phase.

Question 10:

Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context).

- Yes.
- The location factors are favourable for the development of a Solar PV plant including high and good quality solar irradiation (**Figure 1**), flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines and the N10 for transport links.

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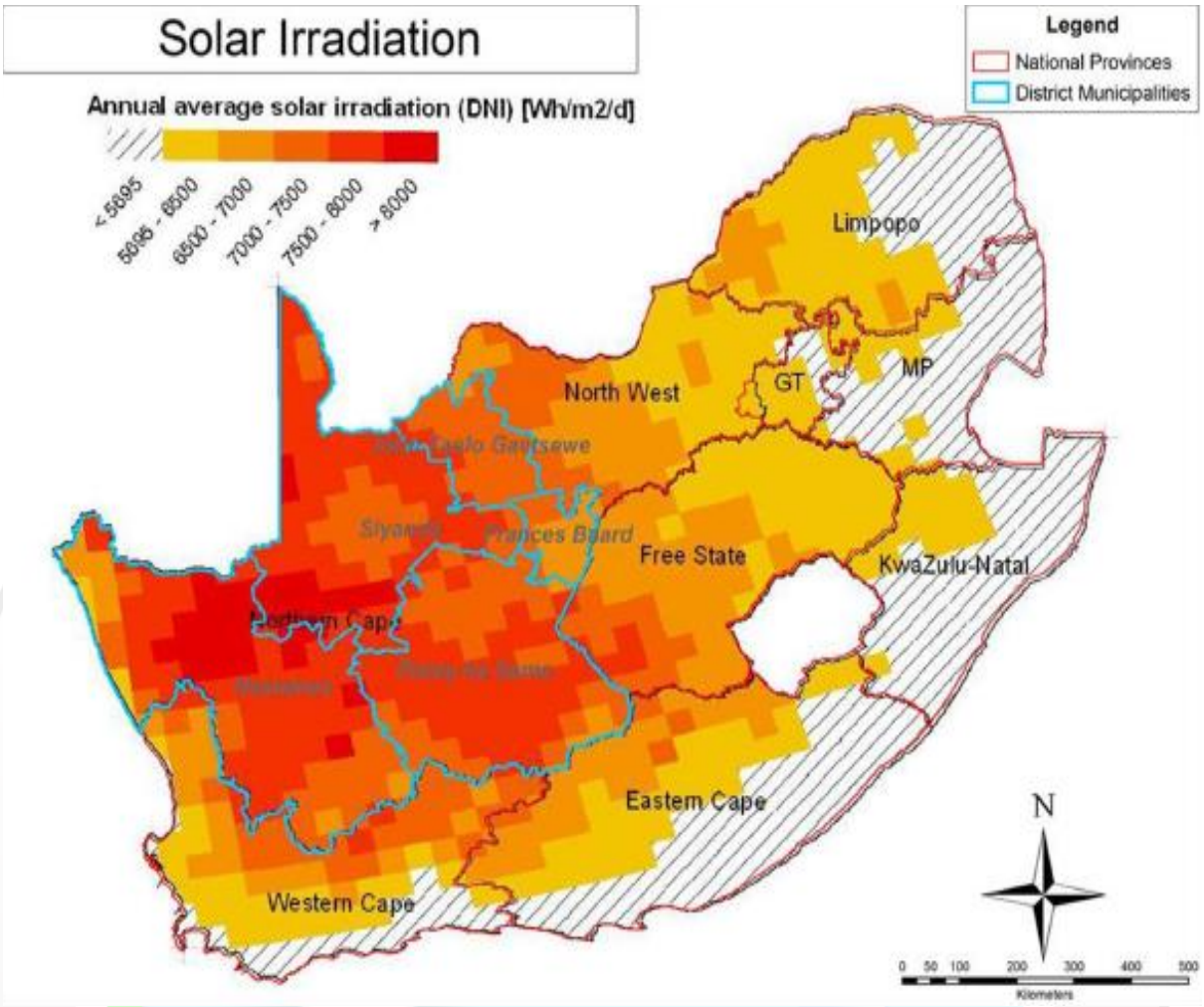

Figure 1. Solar irradiation map indicating the suitability of the Northern Cape for solar related projects (IDP, 2015-2016).

Question 11:

How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?

- The EAP in conjunction with the Project Proponent and landowners has conducted a desk top study using GIS spatial analysis to identify potential development footprints that will have the least impact on the local environment. This exercise was followed up by a site inspection to ground truth the information collected from the desk top study. These findings have identified the potential environmental aspects and impacts that will be further assessed by the appointed Specialist inputs during the EIA phase.
- A Heritage Specialist was appointed to conduct a Heritage Impact Assessment including Archaeology, Palaeontology and Cultural Heritage and delineate sensitive heritage features and areas within the proposed site. All identified heritage sensitive features and areas within the proposed site 'will be avoided in the design of the solar facility footprint.

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- Further, various Specialist were appointed to investigate sensitive elements of the receiving environment (plants, animals, terrestrial biodiversity, aquatic biodiversity, bats and avifauna) that may potentially be impacted on by the proposed development. Highly sensitive ecological features and areas within the proposed site will be avoided in the design of the solar facility footprint.

Question 12:

How will the development impact on people's health and wellbeing (e.g., in terms of noise, odours, visual character and sense of place, etc)?

- The potential impacts on peoples' health and well-being will be assessed during the scoping phase, preliminarily the impact of potential concern is the visual impact that will further be assessed by the appointed specialist, who will conduct a full visual impact assessment.
- The development's socioeconomic impacts were investigated and described in the socio-economic specialist assessment report. Measures to avoid, minimise and remedy potential negative socio-economic impacts will be included in the EMPr as required.

Question 13:

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

Explanation (Question 13):

Opportunity costs can be defined as the net benefit that would have been yielded by the next best alternative (for example, if farming is the next best alternative for a piece of land, then the forgone benefit of losing the farming option will be the opportunity cost of any other land use, or if not proceeding with the activity, then the forgone benefits of the proposed activity is the opportunity cost of not proceeding). Opportunity costs also relate to the use of limited resources, for example water. If a limited volume of water is available in an area the most desirable use of the water considering the needs in the area must be determined in order to consider the opportunity costs associated with the different uses of the water. The concept of opportunity costs is applicable to project alternatives as well as policy selection. It is vital information if decision makers are to understand the implications associated with specific development proposals. A key part of considering opportunity costs is commonly to comparatively consider and assess the different alternatives in terms of the benefits and/or disadvantages associated with each alternative. Opportunity cost is a concept that often need not involve monetary values, though where these values can be given, they allow for a more detailed comparison than would otherwise be possible.

- No, not 'unacceptable' opportunity costs.
- One opportunity cost is the impact on high levels of local Scenic Quality, particularly, the unique agricultural 'Karoo' landscape character as experienced by neighbouring landowners. However, restricting the PV system to lower lying valley areas or grasslands and demarcating significant (200 m) massing and visual sensitivity buffers along selected property boundaries, will reduce the massing effects (created by large scale coverage or expanses of solar PV panels in a rural agricultural landscape setting) to within acceptable levels.

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- There are also relatively few tourism assets or facilities in the area that could be at risk. Business tourism would receive a significant boost.
- Furthermore, as the proposed project will be undertaken and implemented in conjunction with the pre-existing agricultural land use practices, the opportunity costs associated with the combined land uses are greatly improved.
- The potential impacts associated with the proposed project are nonetheless to be assessed by appointed specialists that will concentrate on appropriate environmental aspects related to the proposed activity. These will be on a bio-physical and socio-economic level to determine whether or not replacing the current land use will create an unacceptable loss in opportunity costs.
- The project is anticipated to provide a positive impact on the local area including electricity from a non-polluting renewable energy source, as well as benefits to job creation and skills development.

Question 14:

Will the proposed land use result in unacceptable cumulative impacts?

Explanation (Question 14):

Cumulative impacts can be defined as:

- *Addictive: the simple sum of all the impacts (e.g., the accumulation of ground water pollution from various developments over time leading to a decrease in the economic potential of the resource).*
- *Synergistic effects occur where impacts interact with each other to produce a total effect greater than the sum of individual effects. These effects often happen as habitats or resources approach capacity (e.g., the accumulation of water, air and land degradation over time leading to a decrease in the economic potential of an area).*
- *Time crowding effects occur when frequent, repetitive impacts occur on a particular resource at the same time (e.g., boreholes decreasing the value of water resources).*
- *Neutralizing effects occur where impacts may counteract each other to reduce the overall effect (e.g., infilling of a wetland for road construction, and creation of new wetlands for water treatment).*
- *Space crowding effects occur where we have a high spatial density of impacts on a particular ecosystem (e.g., rapid informal settlement).*
- *Externalisation of disadvantages occurs when there is no, or insufficient consideration given to the associated social costs that will be borne by the public.*

- There are several other renewable energy developments in the wider area and along with the current development, these would potentially generate significant cumulative impacts on habitat loss and fragmentation and negative impact on broadscale ecological processes such as dispersal and climate change resilience.
- However, the location of the proposed solar PV development within mostly low sensitivity habitat and proposed mitigations to fragment the facility into two or more blocks separated by ecological corridors is seen to reduce the significance of its potential contribution to cumulative impact on the local and regional landscape. The impacts on broad scale ecological processes are likely to remain low if the areas that are likely to be important for the maintenance of broad-scale ecological processes (such as dispersal) will remain free of development.

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- The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated. Additional impacts and quantification of cumulative impacts will be assessed by the following appointed specialists:
    - Agricultural Agro-Ecosystem Specialist Assessment
    - Terrestrial Animal Species Specialist Assessment
    - Terrestrial Plant Species Specialist Assessment
    - Terrestrial Biodiversity Specialist Assessment
    - Avifauna Specialist Assessment
    - Aquatic Biodiversity Specialist Assessment
    - Archaeological & Cultural Heritage Specialist Assessment
    - Palaeontological Specialist Assessment
    - Visual Impact Assessment
    - Hydrology Assessment
    - Geotechnical Assessment
    - Geo-Hydrological Assessment
    - Bat Impact Assessment
    - Socio-Economic Impact Assessment
    - Traffic Impact Assessment

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SECTION G: INVESTIGATION OF ALTERNATIVES TO REACH THE PROPOSED PREFERRED ACTIVITY

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including -

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Details of the Alternatives Considered

(i) Details of all the alternatives considered;

"The proponent should be encouraged to explore all possible alternatives, including the Best Practicable Environmental Option (BPEO). The BPEO can be defined as the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society in the long term as well as in the short term" (DEAT, 2004).

Introduction

All environmental impact assessments, which are to be utilised in informing an application for environmental authorisation, must identify and investigate the alternatives to the activity on the environment (Sections 24(4)(b)(i) and 24(4A) of NEMA, 1998) and include a description and comparative assessment of the advantages and disadvantages that the proposed activity and feasible and reasonable alternatives will have on the environment and on the community that may be affected by the activity. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives exist, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not implementing the activity (Sections 24(4)(b)(i) and 24(4A) of NEMA), is required during the assessment phase. In this instance, the EAP managing the application must provide the competent authority with detailed, written proof of the investigation(s) undertaken and motivation indicating that no reasonable or feasible alternatives, other than the preferred alternative and the no-go option, exist.

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Types of Alternatives

In terms of the EIA Regulations, 2014 as amended, "alternatives" are generally considered to be different locations, activities and/or technologies that can meet the general purpose and requirements of a proposed activity:

(1) The property on which or location where it is proposed to undertake the activity. This refers to both alternative properties as well as alternative sites on the same property, or in the case of linear developments, then alternative routes.

"A distinction should also be drawn between alternative locations that are geographically quite separate, and alternative locations that are in close proximity. In the case of the latter, alternative locations in the same geographic area are often referred to as alternative sites. This tends to be the more common application. In some cases it may not be possible to consider alternative locations as there may be constraints to the activity location" (DEAT, 2004).

(2) The design or layout of the activity. Design refers to different architectural and or engineering designs, whereas site layout involves the consideration of different spatial configurations of an activity on a particular site.

"Consideration of different designs for aesthetic purposes or different construction materials in an attempt to optimise local benefits and sustainability would constitute design alternatives. Generally, the design alternatives could be incorporated into the project proposal and so be part of the project description, and need not be evaluated as separate alternatives" (DEAT, 2004).

(3) The type of activity to be undertaken.

"*These are sometimes referred to as project alternatives. Consideration of such alternatives requires a change in the nature of the proposed activity. An example is incineration of waste rather than disposal in a landfill, or the provision of public transport rather than increasing the capacity of roads. In view of the substantive differences in the nature of the proposed activities, it is likely that this category is most appropriate at a strategic decision-making level, such as in a Strategic Environmental Assessment (SEA)"* (DEAT, 2004).

(4) The technology to be used. Technologies include different methods or processes that achieve the same goal, e.g., coal-fired power stations versus solar power plants.

(5) The no-go option, or option of not implementing the activity, is taken to be the existing rights on the property and this includes all the duty of care and other legal responsibilities that apply to the owner of the property (all the applicable permits must be in place for a land use to be an existing right).

Other types of alternatives, such as alternative operational aspects, other means for meeting a demand, alternative inputs, scheduling and timing, and scale and magnitude, are considered throughout the assessment process to address site-specific impacts when a need for mitigation is identified by, for example, the relevant specialist studies.

The key criteria when identifying and investigating alternatives are that they should be "feasible" and "reasonable". The "feasibility" and "reasonability" of and the need for alternatives must be determined by considering, *inter alia*, the general purpose and requirements of the activity.

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Identification of Alternatives

Potentially 'feasible' and 'reasonable' alternatives were identified by considering whether the different types of alternatives could meet the general purpose and requirements of the proposed 400 MW Solar Photovoltaic (PV) facility (**Table 8**).

Table 8. Purpose and Requirements of the proposed activity, specifically a solar PV facility.

Purpose	Requirements
The purpose of a large-scale solar PV facility is to generate electric power by converting energy from the sun and supply that electricity into the national grid for the benefit of South African citizens both directly, and indirectly through sustainable economic growth.	At least 4 hours of peak sunlight. The Northern Cape Province has the highest (5,7 – 6,3 kWhr/m^2) Average Daily Peak Sun Hours in South Africa (https://climatebiz.com/average-peak-sun-hours-south-africa/) (**Figure 1**)
	Low annual rainfall. South Africa is a relatively dry country (464 mm an^{-1}) compared to the world average of (806 mm an^{-1}). Less rain means more chance for peak sun hours, resulting in more power generated from solar PV (https://climatebiz.com/average-peak-sun-hours-south-africa/).
	Flat, clear land; No trees, buildings, relief or other obstacles to avoid shading of solar panels.
	Considerable space (1.5 ha per MW)
	Compatible land use practices, specifically pastoral agriculture.
	Proximity to the national grid, specifically transmission lines; - the line voltage must be close to the voltage that the solar PV facility capacity delivers, and - the line (or a Main Transmission Substation) must have available connection capacity to absorb what your solar facility sends to it.
	Willing landowner (a lease agreement)
	Adequate water (mostly for washing the panels)

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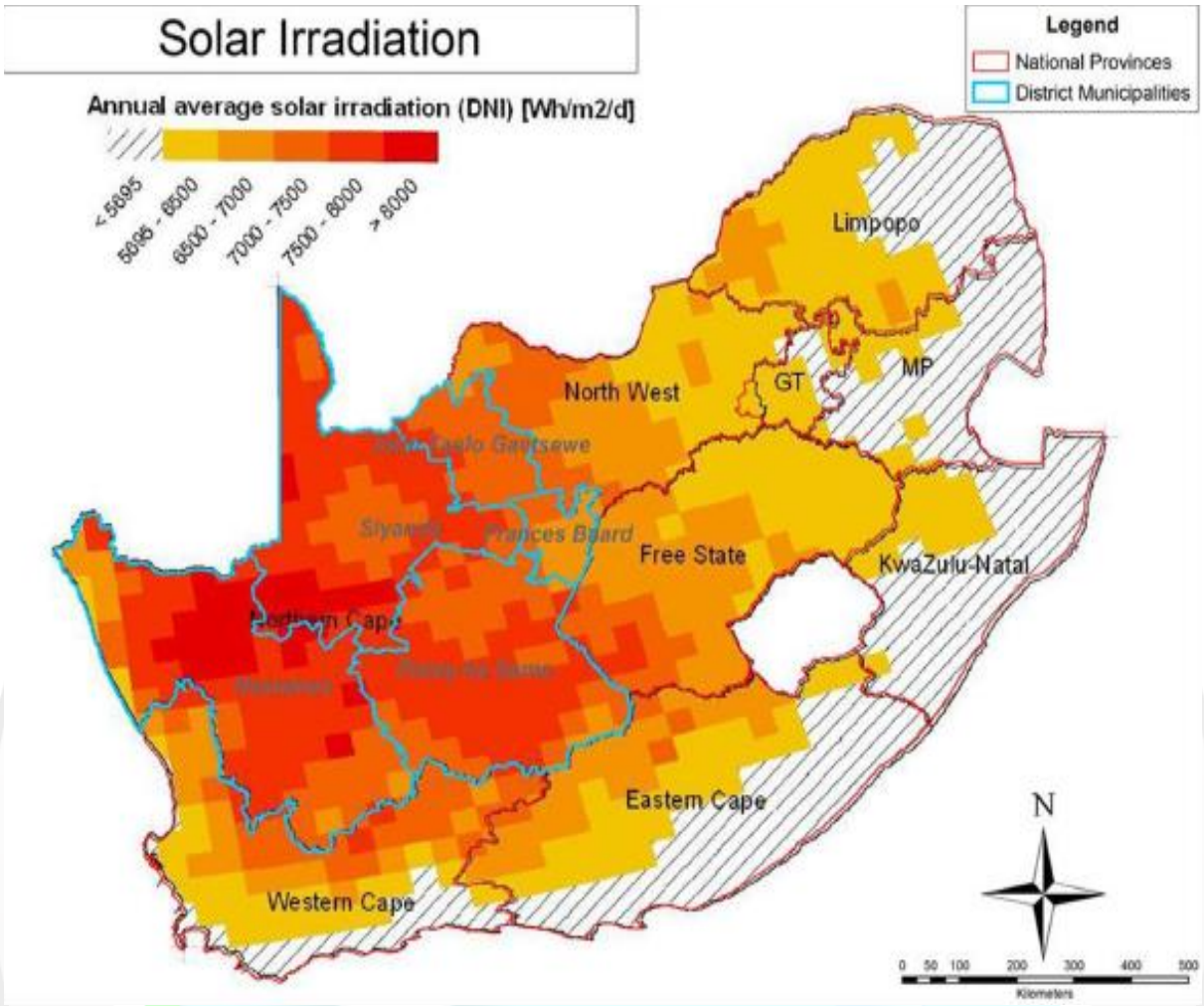

Figure 1: Solar irradiation map indicating the suitability of the Northern Cape for solar related projects (IDP, 2015-2016).

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A Motivation for not considering alternatives

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Alternative No. 1: Property (site) and Location (within the site)

- Purpose and Requirements

The study area falls within the Nama-Karoo Biome. Considering the Nama-Karoo biome is the second largest Biome in South Africa, after the Savanna Biome (http://pza.sanbi.org/vegetation/nama-karoo-biome), there is plenty of space to investigate alternative properties or sites. However, will all potential sites meet the same purpose and requirements of the proposed activity (**Table 8**)?

The Nama-Karoo Biome occurs on the central plateau of the western half of South Africa, including the Northern Cape Province. It has a summer rainfall between 100 and 520 mm an^{-1}, and the dominant vegetation is a grassy, dwarf shrubland (http://pza.sanbi.org/vegetation/nama-karoo-biome). Consequently, the requirements for (1) at least 4 hours of peak sunlight, (2) a low annual rainfall, (3) flat, clear land, (4) considerable space, and (5) pastoral systems can be met throughout the region.

However, not all properties will be in proximity to a 400 kV Eskom powerline, and not all property owners will have an existing lease agreement with the applicant, Soventix South Africa (Pty) Ltd. In other words, the identification and assessment of alternative sites and locations was limited by land ownership, to ensure consent of use for the undeveloped agricultural land within the vicinity of the national grid (and Phase 1).

Eskom Transmission's Hydra-Poseidon Line 1 400 kV powerline and Hydra-Poseidon Line 2 400 kV powerline intersect Mr Willem Retief's south-western most properties, east of the N10 (**Figure 2**).

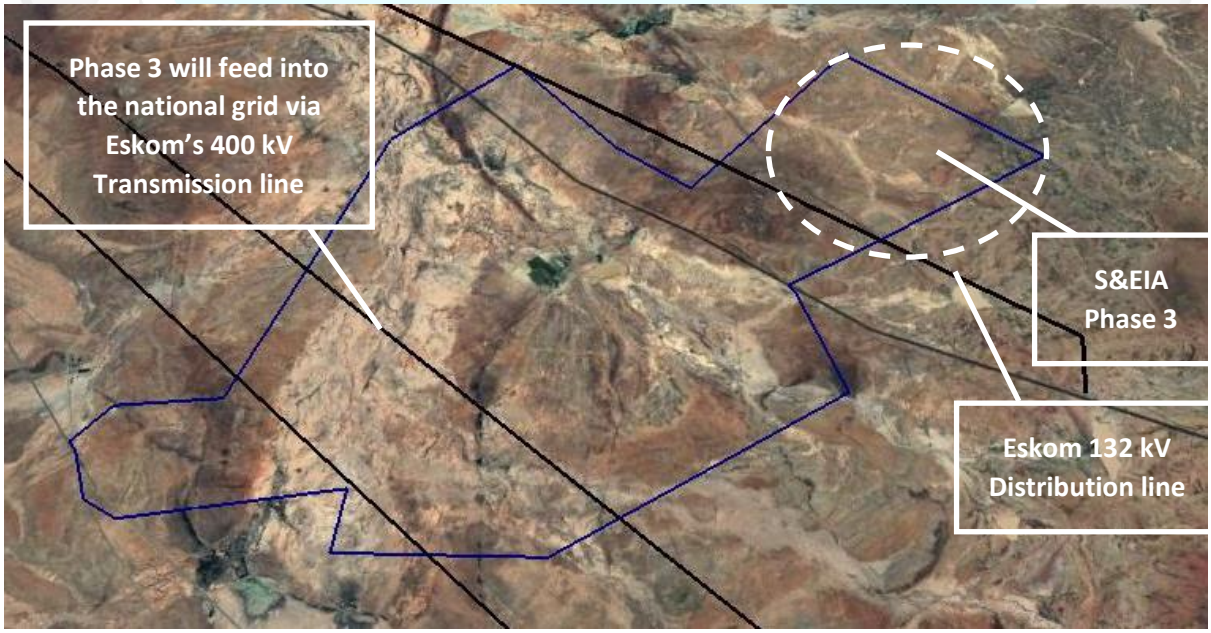

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Figure 2: The location of Eskom's Transmission (220 – 765 kV) and Distribution (66 -132) lines (or servitudes) that intersect Mr Willem Retief's properties (contained within the blue boundary), relative to the proposed 400 MW Solar PV facility (Phase 3) on the Remainder and Portion 3 of the Farm Goede Hoop 26C (north-east of Eskom's 132 kV distribution line.

The farmer with whom the applicant has a lease agreement, Mr Willem Retief, owns several properties. These properties were extensively investigated by several specialists (avifauna, ecological, geological, geotechnical, heritage, aquatic and zoological) in 2016/17 when ecoleges undertook a S&EIA for the development of a 225 MW Solar PV facility on the site. Three alternative footprints (PV01, PV02, PV03) were investigated during the assessment process. The central footprint (PV02) was identified as the preferred option because of its lower environmental impact and proximity to an existing 400kV Eskom powerline when compared with PV01 and PV03. The National Department of Environmental Affairs granted an environmental authorisation (DEA Reference: 14/12/16/3/3/2/998) for PV02 on 16th April 2018 (**Phase 1**).

Furthermore, Soventix will be applying for an environmental authorisation to develop an additional 300MW on the PV03 footprint (**Phase 2**) that was considered during the initial S&EIA. It is proposed to connect this second phase to the 400 kV substation that forms part of the authorised facility on PV02.

It turns out, from the specialist assessments that were completed in 2016/17, that most of the properties are environmentally sensitive, leaving only a few isolated pockets of land for further development (**Figure 3**), specifically for **Phase 3**.

Renewable energy systems generally need more space than fossil fuels. One way to compare the different energy systems or resources is to use the concept of power density – the average electrical power produced in one horizontal m^2 of infrastructure. Solar energy yields the highest median power density per renewable energy system (solar, geothermal, wind, hydro, and biomass), but solar and wind power needs around 40-50 times more space than coal. (J. van Zalk & P. Behrens, 2018).

J. van Zalk & P. Behrens (2018). The spatial extent of renewable and non-renewable power generation: A review and meta-analysis of power densities and their application in the U.S., Energy Policy, Volume 123, Pages 83-91, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2018.08.023. (https://www.sciencedirect.com/science/article/pii/S0301421518305512)

Solar systems require 1,5 ha to generate 1 MW of energy, so the proposed 400 MW solar PV facility for Phase 3 requires an area of 600 ha. Consequently, the only remaining contiguous properties that are large enough for Phase 3 includes the RE and Ptn 3 of the Farm Goede Hoop 26C (**Figure 3**).

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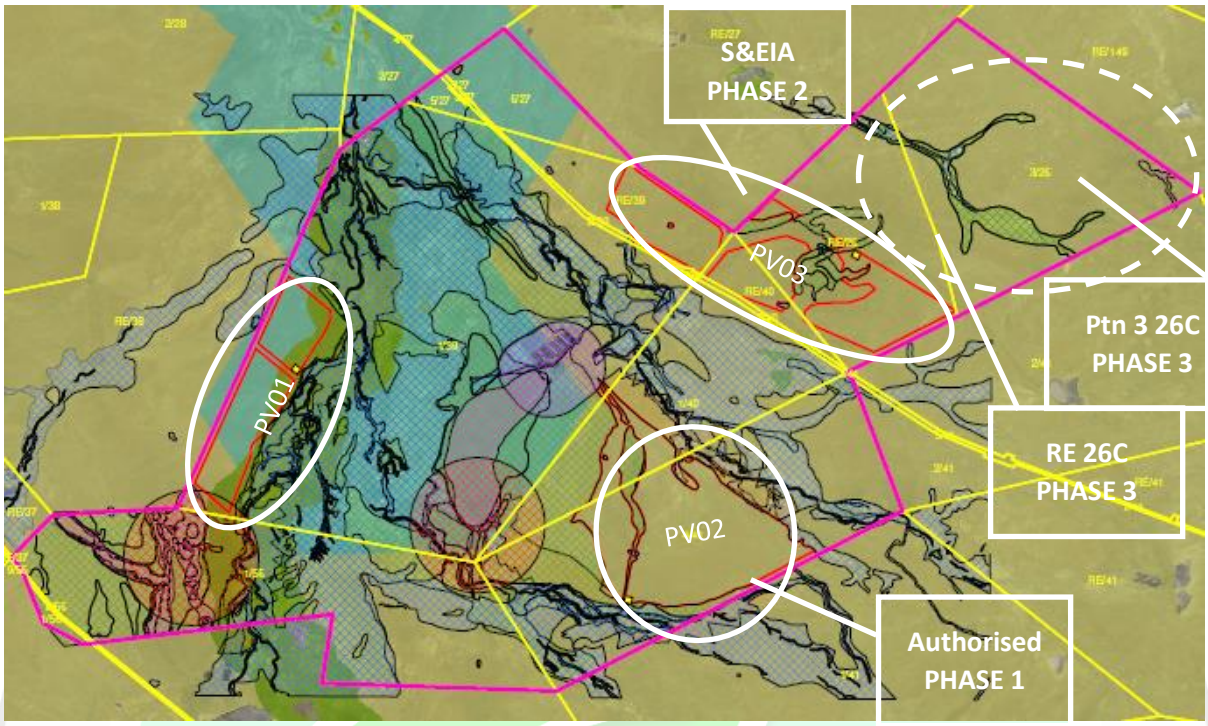

Figure 3: The environmental sensitivity of the landowner's properties (inside the pink boundary) The patterned and coloured areas represents designated "No-Go" zones for development and CBAs, which were identified during the S&EIA process in 2016/17 (Plan number: "Cumulative impact Goedehoop_Solar_Array_v3" prepared by Digital Earth and dated 24/07/2017).

The Remainder of Farm Goede Hoop 26C is 1 502,8325 ha (Title Deed). However, only a fraction of that property is available for Phase 3 because most of it has been set aside for Phase 2 or is ecologically sensitive. Then, Portion 3 of Farm Goede Hoop 26C is 1 015,9683 morgen (SG Diagram). One (1) (South African) morgen = 0.8567 hectare. Therefore, Portion 3 of the Farm Goedehoop 26C is 870,380 ha. Consequently, the combined available surface area of both properties is circa 1 200 ha. Given the proposed 400 MW solar PV facility requires 600 ha, there would theoretically be enough space to consider two alternative locations within the preferred site (The Remainder and Portion 3 of Farm Goede Hoop 26C). However, the area is not homogenous. So, if a person carves out the ecologically sensitive areas that were identified by the specialist(s) during the S&EIA in 2016/17, it becomes clear that there is only space for one location, comprising two adjacent but non-contiguous areas, within the preferred site (**Figure 4**).

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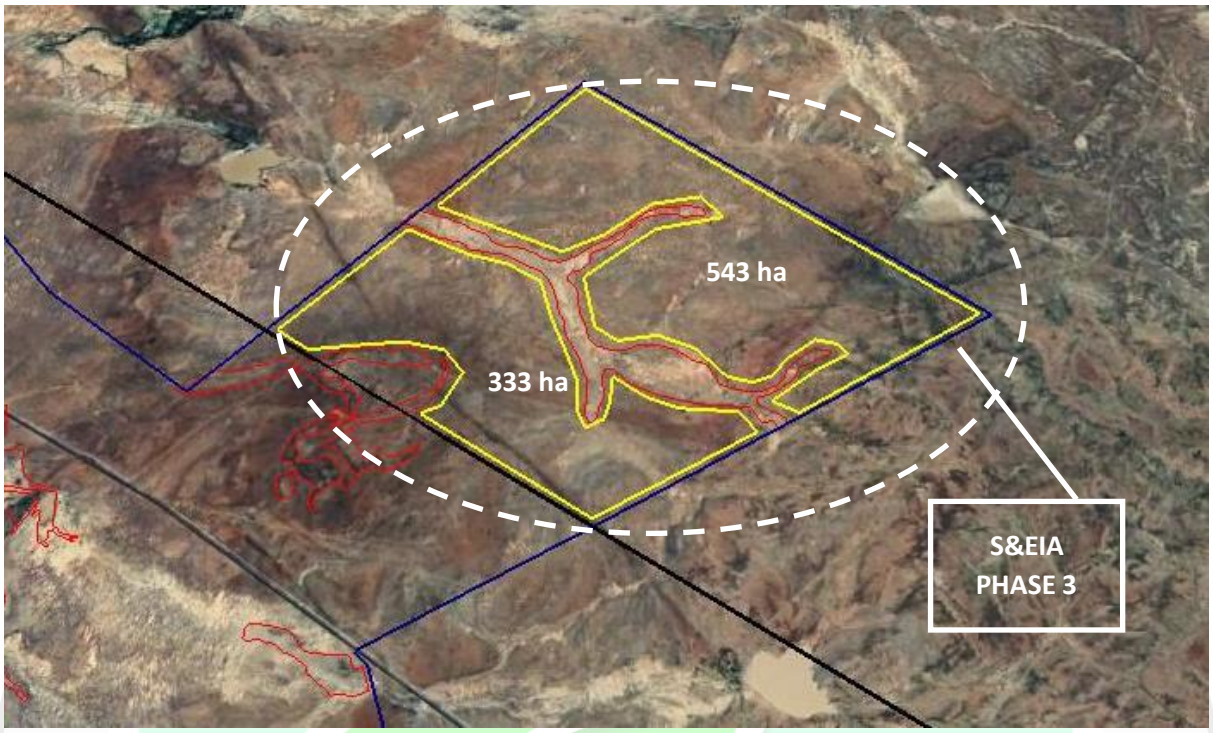

Figure 4: The potentially available surface area (876 ha) for the development of a 600 ha solar PV facility on the Remainder and Portion 3 of the Farm Goede Hoop 26C. The red outlines demarcate ecologically sensitive areas.

- Reasoned explanation why an alternative was not found to be reasonable or feasible

The selection of the least sensitive site & location has the largest mitigating effect on environmental impacts to the receiving environment.

Of all the potential properties owned by Mr Willem Retief, only the two contiguous farms, being the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, are available for the proposed development of Phase 3 because they contain the only consolidated surface area (outside "No-Go" zones and CBAs) that is big enough to support a 600 ha solar PV facility. However, the available surface area for development is still restrictive (876 ha), limiting the assessment to a single preferred location.

Alternative No. 2: Design and Layout

- Purpose and Requirements

Alternative solar PV plant designs and layouts within the preferred site and location can realistically meet the general purpose and requirements for a solar PV facility. The design and layout parameters of the solar facility are governed by several factors including but not limited to the orientation of the facility, within the preferred site and location, to ensure a predominantly northern orientation, in order to optimise the absorption of, and reduce the reflection of, incoming solar radiation (insolation). Additionally, the layout will be affected by the presence of existing services (servitudes), farm boundaries, building setback lines, access points and routes, possible visual impacts, and ecological buffers from sensitive environmental receptors.

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Consequently, and particularly given the modular arrangement of Solar PV facilities, it is far more efficient and effective to identify sensitive environmental attributes and eliminate them from the preferred location to inform the best practicable environmental design/layout (or preferred development footprint) rather than assess different spatial configurations at the onset of the Scoping Phase.

The preferred layout will therefore not be determined by an assessment of alternative configurations, but will instead, be the product of a holistic and multi-disciplinary investigation involving various online spatial planning tools including but not limited to the National web-based environmental screening tool (https://screening.environment.gov.za/screeningtool/), SANBI BGIS platform (http://bgis.sanbi.org/MapViewer), SA Protected Areas and Conservation database (https://egis.environment.gov.za), the Surveyor-General Property Search platform (https://csggis.drdlr.gov.za/psv/), and independent Geographic Information System (GIS) analyses, as well as the site-specific findings and recommendations of all the specialist assessments.

The high-level sensitivities generated for the relevant environmental themes by the Screening Tool were verified on-site as part of the mandatory Site Sensitivity Verification (SSV) Process and Report required in terms of GN No. 320, 20 March 2020 and GN No. 1195, 30 October 2020. The SSV report was provided to the specialists identified in terms of the Screening Report, as part of their Terms of Reference (ToR) to inform the scope of their assessments. The extent of the verified levels of sensitivity from each specialist will then be used in the impact and risk assessment process, inclusive of cumulative impacts, to ultimately identify and motivate the preferred layout alternative.

- Reasoned explanation why an alternative was not found to be reasonable or feasible

Design elements contribute to the power generational efficiency and therefore financial feasibility of the proposed development. Consequently, alternative design elements, such as alternative mounting systems, choice of solar PV modules (or panels), and solar tracking versus fixed modules, were taken into consideration by the applicant, Soventix (Pty) Ltd, using their in-house expertise to determine the most optimal solar PV plant design for the preferred site.

Driven piles as opposed to ballast foundations are preferred but will be determined by the geological conditions of the site. Although tracking systems incur an increased maintenance cost to fixed systems, they increase the performance of the modules compared with a fixed configuration. This improvement is mainly experienced early and late in the day and caters for more of the morning and evening electricity usage peaks. Bifacial Mono Perc solar panels produce power from both sides of the panels, further increasing total energy generation.

Soventix (Pty) Ltd.'s investigation determined that the optimal solar PV plant design for this site should include a single-axis tracker together with Bifacial Mono Perc solar panels, supported on piles rammed into the ground. Consequently, the assessment of alternative designs need not be repeated here.

Furthermore, the preferred layout will not be determined by an assessment of potentially flawed alternative configurations, but will instead, be the product of a holistic and multi-disciplinary investigation, involving various online spatial planning tools and the site-specific findings and recommendations of all the specialist assessments. The aim of the investigation is to identify and eliminate sensitive environmental attributes from the preferred location, and in so doing arrive at the preferred development footprint (or layout).

Alternative No. 3: Type of Activity

- Reasoned explanation why an alternative was not found to be reasonable or feasible

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No alternative activity exists within the South African context that is an ongoing energy crisis combined with political commitments to reduce greenhouse gas emissions under the United Nations Framework Convention on Climate Change and its Paris Agreement.

South Africa's electricity infrastructure has been degrading in the past decades, with both scheduled and unscheduled power outages on the increase. Simply put, South Africa cannot make enough electricity to supply its people and economy.

Apart from load shedding, creating an awareness of and implementing power saving initiatives to reduce demand, no alternative exists other than "to rapidly expand our energy generation capacity" (President Cyril Ramaphosa: 2021 State of the Nation Address, 2021 https://www.gov.za/speeches/president-cyril-ramaphosa-2021-state-nation-address-11-feb-2021-0000)

However, most (80%) of our electricity is made by burning coal; Eskom is the country's largest greenhouse gas emitter. Climate change poses a threat to our environmental health, socioeconomic development, and economic growth. So, if South Africa is to transition into a low-carbon economy and climate resilient society, expansion of our energy generation capacity must comprise alternative renewable energy sources, such as solar.

Alternative No. 4: Technology

- Purpose and Requirements

An example of an alternative technology for generating electric power from the sun is Concentrating Solar Power or CSP. Photovoltaic (PV) systems convert sunlight directly to electricity by means of PV cells made of semiconductor materials, whereas CSP systems concentrate the sun's energy using reflective devices such as troughs or mirror panels to produce heat that is then used to generate electricity.

Apart from one exception, CSP can meet the same purpose and requirements as Solar PV (**Table 7**). In fact, current CSP plants can store thermal energy for up to 16 hours, which means that their production profile can match the demand profile (just like a conventional power plant), delivering greater grid stability than PV. PV is not dispatchable, as a feasible commercial energy storage system does not yet exist (https://www.renewableenergyworld.com/storage/how-solar-pv-is-winning-over-csp/#gref and https://www.solarfeeds.com/mag/csp-and-pv-differences-comparison/).

The abovementioned exception refers to the availability of adequate water during operation.

Solar abundance and water constraints converge in arid and semi-arid regions, like the Nama-Karoo. In these regions, water supply is an issue for locating any thermoelectric power plant, not only CSP. In all thermoelectric power plants, whether fossil (coal), nuclear, or CSP, heat is used to boil water into steam, which spins a steam turbine to generate electricity. The exhaust steam from the generator must be cooled prior to being heated again and turned back into steam.

The steam turbines at CSP facilities are generally cooled using water, in a process known as wet cooling. Most of the water is consumed in the cooling process; this cooling water flows to an evaporative cooling tower that dissipates the collected heat energy to the environment as clouds of water vapor.

Admittedly, the choice of cooling technology largely determines how much water is actually consumed at a CSP facility; this cooling can be done with water (wet cooling) or air (dry cooling), or a combination of both (hybrid cooling). Wet cooling of thermal power plants means warmer water is sent out into natural watercourses, whereas with dry cooling air is used as the cooling medium and expelled at a higher temperature than the ambient temperature. Generally, dry cooling using air is less efficient,

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produces less electric energy and increases the production costs, but the extent will depend on *inter alia* a location's maximum daytime temperatures, the technology employed (e.g., trough versus tower technology) and mitigating factors. Water cooling is the most efficient, but CSP facilities using wet cooling can consume more water per unit of electricity generated than traditional fossil fuel facilities with wet cooling.

In summary, CSP plants using parabolic trough or power tower technologies must use some form of cooling. CSP facilities using wet cooling technology require access to water whereas Solar PV facilities do not require water for cooling.

Apart from those CSP facilities which use wet cooling technology, the other main operational water requirements for both CSP and PV facilities relate to panel/mirror washing, and potable supply for the workforce.

High soiling rates occur in arid regions due to the combination of low precipitation and dusty conditions. In general, dust accumulation on the CSP mirrors results in the light being scattered and absorbed leading to a reduction in reflectance. Dust also reduces performance in PV plants by reducing the solar irradiance that the modules receive. For this reason, regular cleaning of the CSP mirror surfaces and PV module surfaces is required, which needs a considerable amount of water making soiling an important factor for the overall water consumption of these plants. Although CSP mirror and PV module wet cleaning solutions require a similar amount of water, the reflective surface of CSP mirrors typically need to be cleaned more frequently than a PV module surface because its performance is more sensitive to soiling (Haack & Schlecht, 2019). In other words, while a small amount of dust may slightly hinder the performance of a PV plant, the same amount of dust can greatly affect the performance of a CSP plant. Given the greater 'robustness' of Solar PV panels, a further reduction in the total water consumption is possible if dry cleaning is applied to the PV system (pers. comm JP De Villiers, Managing Director, Soventix).

Reference: L. Haack & M. Schlecht. Water saving potential of CSP-PV hybrid plants. AIP Conference Proceedings 2126, 220003 (2019); https://doi.org/10.1063/1.5117762 Published Online: 26 July 2019

- Reasoned explanation why an alternative was not found to be reasonable or feasible

The applicant is Soventix South Africa (Pty) Ltd, a subsidiary of Soventix GmbH in Germany, which specialises in the design (engineering), procurement of components and construction of solar PV systems up to large-scale solar facilities (www.soventix.co.za). As such, it is unreasonable to expect the applicant to employ an alternative technology that is outside their field of expertise. Furthermore, the proposed development of a 400 MW Solar PV facility (Phase 3) is effectively the expansion of an already authorised 300 MW Solar PV facility in the same area (DEA Reference: 14/12/16/3/3/2/998, dated 16th April 2018). Considering the cost of building a 400 kV substation (circa R750 mil.) to tie the authorised facility into the national (Eskom) grid, Phases 2 and 3 are necessary to make the entire project financially feasible (pers. comm. JP De Villiers, Managing Director, Soventix).

Notwithstanding the aforesaid, water resource constraints within the Nama-Karoo prompt the adoption of more freshwater-efficient technologies or decisions not to site CSP facilities. It is sufficient to surmise that a CSP using wet cooling technology would require significantly more water during operation for cooling and maintenance (washing mirrors) compared with a Solar PV facility, increasing the potential for depleting limited groundwater resources within the region.

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Note: Given the number of environmental and technological variables within the CSP space, and therefore outcomes, it is unreasonable to expect an investigation of all potential combinations to make a meaningful comparison of water consumption with the proposed preferred Solar PV facility, the subject of which would be sufficient for a thesis. Another aspect worth researching is the "heat island effect" of CSP versus PV.

Alternative No. 5: No-go Option

The option of not implementing the activity is used as the benchmark against which all impacts associated with the proposed development were assessed. In this case, the no-go option would be to not rezone and develop Phase 3 to operate as an "Agrivoltaic" system (the simultaneous use of land for both solar photovoltaic power generation and agriculture) and retain the land use for grazing sheep only.

Conclusion

No alternatives other than the no-go option were identified for further assessment.

Other criteria that will be considered during the comparative assessment to determine which potentially reasonable and feasible alternative is the Best Practicable Environmental Option, include need and desirability, opportunity costs, the need to avoid negative impact altogether, the need to minimise unavoidable negative impacts, the need to maximise benefits, and the need for equitable distributional consequences. The (development) alternatives must be socially, environmentally, and economically sustainable. They must also aim to address the key significant impacts of the proposed development by maximizing benefits and avoiding or minimising the negative impacts.

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Details of the Public Participation Process

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Level of Public Participation

Introduction

The Public Participation Process (PPP) was undertaken in accordance with Chapter 6 of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, and took the Public Participation 2017 Guideline Document (DEA, 2017) into consideration.

Objectives of the public participation

The level of public participation was determined by taking into account the scale of the anticipated impacts of the proposed development, the sensitivity of the affected environment and the degree of controversy of the project, and the characteristics of the potentially affected parties. Based on the findings of the above considerations, and taking cognisance of the Covid-19 pandemic, it was decided to fulfil the minimum requirements of the public participation process outlined in the EIA Regulations, 2014 whilst taking precautions that avoid public gatherings. These precautionary measures are discussed in more detail under 4.1(e) of this report.

Identification of interested and affected parties

Over and above the erection of site notices at key intersections and on the property's boundary fence, placing an advert in the local newspaper and distributing a written notice to those I&APs identified in Regulation 41(2)(b), certain stakeholders, such as the Square Kilometre Array (SKA), were specifically approached and invited to participate in the Environmental Impact Assessment process.

Additional means of identifying potential stakeholders included:

- property and deeds search to identify all adjacent landowners and include them as directly affected I&APs; and
- a network or chain referral system according to which key stakeholders were asked to assist in identifying other stakeholders, including requesting in the circulated BID document: "Please can you be so kind as to distribute the attached notice(s) to other interested and affected parties falling under your jurisdiction, authority, control, or administration, such as other owners, persons in control or occupiers of common land. The third attachment entitled "Notice occupiers" has been abbreviated for the occupiers of land, including for example, the local labour or work force. Otherwise, you are welcome to provide their contact details to us, and we shall inform them directly."

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Notification of interested and affected parties

All potential and registered interested and affected parties have the right to be informed early and in an informative and proactive way regarding proposals that may affect their lives or livelihoods. Early communication aims to build trust among participants, allow more time for public participation, and improve community analysis. It also increases opportunities to modify the proposed development to effectively address relevant issues and comments received during the public participation process.

To this affect potential and registered interested and affected parties were first notified about the proposed development on **18th February 2022** and given at least 30 days before the submission of the Application to register for the public participation process.

Method of notification

In terms of Regulation 41(2), notice of the application will be given to all potential interested and affected parties by -

- fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of –
    i. the site where the activity to which the application relates is or is to be undertaken; and
    ii. any alternative site.

Three site notice boards were placed at various visible locations on the 16th February 2022, namely:

Site notice board No. 1 was placed on the boundary fence at the corner of portion 3 of Farm Goede Hoop 26 and Portion 2 of the Farm Taaiboschfontain 41 (Latitude: 30°50'12.64"S Longitude: 24°23'19.70"E).

Site notice board No. 2 was placed on the entrance gate to the Remainder of Farm Goede Hoop 26 C (Latitude: 30°50'54.64"S & Longitude: 24°19'29.00"E).

Site notice board No. 3 was placed at the intersection of the N10 highway with the District road to Burgerville (Latitude: 30°52'31.61"S & Longitude: 24°13'27.31"E).

There are no alternative sites.

See **Annexure A of the PPP Report attached as Appendix C:** Site Notice Board Locations and **Annexure B of the PPP Report attached as Appendix C:** Site Notice Boards

- giving written notice to –
    i. the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is to be undertaken, and to any alternative site where the activity is to be undertaken,
    ii. owners, persons in control of, and occupiers of land adjacent to the site where the activity is to be undertaken and to any alternative site where the activity is to be undertaken,
    iii. the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area,
    iv. the municipality which has jurisdiction in the area,

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v. any organ of state having jurisdiction in respect of any aspect of the activity, and

vi. any other party as required by the competent authority.

The written notice was prepared in two different formats. The full format (**Annexure D1 of the PPP Report attached as Appendix C**) or Background Information Document (BID), was intended for landowners, whereas the simplified and abbreviated version (**Annexure D2 of the PPP Report attached as Appendix C**) was intended for the occupiers of land, e.g., farm workers. An English and Afrikaans version of each format was prepared.

Email distribution of the written notices (**Annexure D3 of the PPP Report attached as Appendix C**) to the owners or persons in control of land adjacent to the application site commenced on 17th February 2022. Email submissions included a request for a "delivery receipt" and a "read receipt." Landowners or persons in control were kindly requested to provide copies of the abbreviated format to any occupiers of their land or land under their control.

The proponent or applicant, Soventix South Africa (Pty) Ltd (represented by Jean Paul de Villiers) is not the owner (or person in control) of the site. The landowner, De Bad Familie Trust (represented by Willem Retief), was included in the distribution of the written notice and requested to forward the notice to any occupiers of the site.

Additional recipients of the written notices included *inter alia* the municipal councillor of the ward, any organisation of ratepayers, the Emthanjeni Local Municipality, Pixley Ka Seme District Municipality and State departments that administer a law relating to a matter affecting the environment relevant to this application, such as the regional Department of Water and Sanitation (Orange Proto Catchment Management Agency) and the South African Heritage Resources Agency (a case No. 17965 was created and the BID was uploaded on their online platform called SAHRIS - **Annexure D4 of the PPP Report attached as Appendix C**).

A full list of identified potential I&APs is not included in this report in terms of the Protection of Personal Information Act, 2013 (POPIA), but is available to the Department upon request.

On the other a hand, the register of registered I&APs is readily available in **Annexure G of the PPP Report attached as Appendix C**.

- placing an advertisement in –
  - i. one local newspaper; or
  - ii. any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

An advertisement was published on the inner back page of a local newspaper in De Aar, called the "The/Die Echo" on 18th February 2022 (**Annexure C of the PPP Report attached as Appendix C**)

A link to the advertisement was also provided to Mr JR Ranelo (lranelo@emthanjeni.co.za) at the Emthanjeni Local Municipality so that he could post it on the municipal Facebook page (Email sent on Monday, 21 February 2022 14:05)

- placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it will be undertaken.

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The proposed activity shall not have an impact that extends beyond the boundaries of the local or district municipality in which it will be undertaken.

- using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to illiteracy, disability or any other disadvantage.

Public meetings will be avoided. Any person or official desirous of a meeting will be hosted individually. Hard copies of reports will not be printed and placed in public places. Instead, digital copies will be distributed electronically. A hard copy will be posted to any person or official desirous of a hard copy. "Afrikaans is the home language of almost two thirds of the residents in Ward 6" (Social Scoping Report April 2022 prepared by Equispectives Research & Consulting Services). Considering that Afrikaans is widely spoken in the De Aar Area, the written notice or Background Information Document (BID) shall be prepared and distributed in both English and Afrikaans. "About two fifths of the people in Ward 6 aged 20 years or older have no schooling or only some primary education. This is higher than on local, district or provincial level. These high levels of illiteracy should be taken into consideration when consulting with farmworkers or communities on the project" (Social Scoping Report April 2022 prepared by Equispectives Research & Consulting Services) – A simplified English and Afrikaans version of the Background Information Document (BID) shall be made available to landowners during the email distribution of the BID, specifically for the attention of their farmworkers. A Social Impact Assessment shall be undertaken by Equispectives Research & Consulting Services, using methodologies which ensure the affected communities are consulted in a way that is most appropriate to the community.

In terms of Regulation 42, all organs of state which have jurisdiction in respect of the proposed activity and all persons who submitted written comments, attended meetings with the applicant, proponent or EAP, or who requested, in writing, to be registered will be placed on a register of interested and affected parties (**Annexure G of the PPP Report attached as Appendix C**).

Proof of notification

Proof of Notification via email is provided in **Annexure D3 of the PPP the Report attached as Appendix C**.

Notification of interested and affected parties of reports and other studies

Reports, including specialist studies were made available to registered I&APs by loading the documents onto our website (www.ecoleges.co.za) and then emailing the link and password to them. Proof of Notification via email is provided in Annexure D3.

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Proof of Open Communication with Adjacent Landowners

Due to security concerns in the area, it was important to maintain ongoing and open communication with adjacent landowners with regards to activity in the area as a result of various specialists who will be in the area conducting site assessments. Email notification was provided to adjacent landowners regarding the presence of various specialists in the area (**Annexure D5 of the PPP Report attached as Appendix C**).

Furthermore, neighbours whose concerns were brought to us by a third party were also pro-actively approached and their comments addressed in the Comments and Response Report (**Annexure H of the PPP Report attached as Appendix C**).

Comments from interested and affected parties

Registered I&APs were given access to, and the opportunity to comment on, all written submissions via email, fax and/or registered mail. Email submissions included a request for a “delivery receipt” and a “read receipt,” The tracking number of any registered mail was sent to the I&AP via sms and/or WhatsApp to facilitate receipt of the document. All comments received from interested and affected parties (**Annexure E of the PPP Report attached as Appendix C**) were responded to and recorded in the Comments and Response Report (**Annexure H of the PPP Report attached as Appendix C**).

Final Notification of Decision

Once a decision has been made, all registered interested and affected parties will be notified via email, fax and/or registered mail. The decision may also be provided to local councilors in a notice format to erect on community notice boards.

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Summary of the Issues raised by Interested and Affected Parties

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(iii) a summary of the issues raised by interested and affected parties, and an indication of the matter in which the issues were incorporated, or the reasons for not including them;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

A Summary of the Main Issues raised by Interested and Affected Parties

1) Safety and crime due to the development.
2) Night-time illumination of the area for 'security reasons.'
3) View impairment - the view will no longer be a nature scenery.
4) Decrease in property value.
5) Road conditions.
6) Risk of veld fires caused by workers during the construction of the plant.
7) Risk of solar panels being damaged during the hunting season.
8) Heat generation and reflection by the thousands of black solar panels, angled in the direction of a neighbouring landowner, namely north.

(**Annexure H of the PPP Report attached as Appendix C)**

A Summary of the Response from the Practitioner to the Issues raised by the Interested and Affected Parties

1) <u>Security during construction</u>
   - Security during construction will be mitigated by erecting the perimeter fence first to prevent any movement out of the development footprint.
   - No accommodation shall be provided for contractors and sub-contractors on the construction site.
   - Furthermore, the number of construction workers will be limited by building the facility in sequential phases of 100 MW blocks as opposed to trying to build the 400 MW facility in one go.
   - Security will be appointed throughout construction. All contractors and workers will need to wear photo identification cards and vehicles will need to display vehicle logos, making it easier for surrounding landowners (farmers) to identify strangers. Furthermore, it will be proposed that the applicant communicate with the landowners before the construction phase commences to formalise and familiarise the local farmers with the aforesaid security arrangements.

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- An induction programme that includes a Code of Conduct for all contractors and sub-contractors shall be developed.

Security during operation

- Security will be appointed throughout operation to discourage criminal elements. The facility will also be fenced off with a 2.5 m high wire mesh security fence with controlled access using a security gate. Furthermore, the perimeter fence line will be secured using multiple FLIR PTZ security cameras which have a 2km range in absolute darkness.

2) Night-time illumination

- There will be no to minimum lighting (the exceptions being the substation as it is an Eskom requirement, and key operational areas like the security control room and gate). The fence line will be secured using multiple FLIR PTZ cameras which have a 2km range in absolute darkness.

3) View impairment

- A Landscape/Visual Impact Assessment will be undertaken during the EIA process. The appointed specialist undertaking the Landscape/Visual Impact Assessment is Stephen Stead of Visual Resource Management Africa. The site assessment for the above specialist assessment is scheduled for 14 March 2022. Stephen will contact the neighbour beforehand for permission to access their farm so that he can investigate the concern. The I&AP will be updated on the findings and any proposed mitigation measures proposed by the appointed visual specialist during the EIA process.

4) Decrease in property value

- A Socio-economic Impact Assessment will be undertaken during the EIA process. We have asked the specialist to as far as is possible research the validity of the said claim that solar PV facilities in rural areas reduce the property value of farms. The I&AP will be updated on the findings and any mitigation measures proposed by the appointed specialist during the EIA process.

5) Road conditions

- The applicant shall maintain any deterioration to the district gravel roads resulting from increased traffic during construction.
- A Traffic Impact Assessment shall be undertaken. Specialist Assessment and a Terrestrial Biodiversity Assessment will be undertaken during the EIA process. The I&AP will be updated on the findings and any mitigation measures proposed by the appointed specialist during the EIA process.

6) Risk of veld fires

- Risk of veld fires both during the construction and operational phases has been identified as a potential impact. It should be noted that no accommodation shall be provided for contractors and sub-contractors on the construction site. Nonetheless, we intend on addressing this concern by proposing the following mitigations.

  i. Open fires are prohibited;
  ii. Burning of waste is prohibited; and

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iii. Maintenance of firebreaks around the perimeter of the proposed development.

7) Damaged solar panels

- Your concern is a real risk and very much appreciated. We welcome any suggestions that will improve the safety of neighbouring landowners and their property during the hunting season, such as identifying no shooting zones, notifying neighbouring properties of imminent hunts, hunters taking out the appropriate insurances, etc.

8) Heat generation

- Heat generation is something we will be researching; it is a phenomenon called the heat island effect but should be localised to the footprint where the sun's energy is absorbed.

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Environmental attributes associated with the preferred site and location alternative

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

The level of sensitivity (or sensitivity rankings) relating to the environmental attributes of the preferred alternative site relative to the no-go option (**Table 9**) was assessed using the results from the Screening Report (dated 02nd February 2022) generated by the Department's National web-based environmental screening tool and referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. The results of the screening tool were confirmed (or disputed) by means of a Site Sensitivity Verification undertaken on 16th February 2022 according to the requirements in terms of GN 320 of 20th March 2020.

Table 9. Sensitivity of the environmental attributes associated with the preferred alternative site and no-go option.

Aspect→ Alternative↓	geographical	physical	biological	social	economic	Heritage and cultural
Alternative Site No. 1 (preferred)	Low	Very High	High	Very High	Medium	Very High
No-go option	Low	Very High	High	Very High	Medium	Very High

Legend	Very High	High	Medium	Low

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References (Source of information) used to designate levels of sensitivity in Table 9

Geographical aspect:

Strategic Areas

- The study area is located within a Strategic Transmission Corridor according to the Screening Report (and GN No. 113 in GG No. 41445 of 16 February 2018, as well GN No. 383, GG No. 44504 of 29 April 2021).
    - In terms of GN No. 113 dated 16 February 2018, "Applications for an environmental authorisation for large scale electricity transmission and distribution facilities, where such facilities trigger 9 of the Environmental Impact Assessment Regulations Listing Notice 2 of 2014 and any other listed and specified activities necessary for the realisation of such facilities, and where the greater part of the proposed facility is to occur in one or more such Strategic Transmission Corridors, must follow the basic assessment procedure contemplated in Regulation 19 and 20 of the Environmental Impact Assessment Regulations, 2014 in order to obtain environmental authorisation, as required in terms of the Act." – **The proposed development which is the subject of this application does fall within the "Central Corridor" but does not trigger LA 9 of LN2.**
- The study area is not located within a (REDZ).
    - Renewable Energy Zones together with the procedures to be followed when applying for environmental authorisation for a large-scale wind and solar facility within these areas were published under GN No. 114, GG No. 41445 of 16 February 2018, as well as GN No. 786 of 17 July 2020 - **The proposed development which is the subject of this application does not fall within any of the eleven (11) identified Renewable Energy Development Zones.**
    - In terms of GN No. 145 dated 26 February, 2021, "The scope of this notice applies to …an application for environmental authorisation when triggering the following activities related to the development of electricity transmission and distribution infrastructure (Activity 11 of Listing Notice 1 and Activity 9 of Listing Notice 2)… where the greater part of the activity is undertaken within a Renewable Energy Development Zone…" – **Whilst the proposed development which is the subject of this application does trigger Activity 11 of Listing Notice 1, the proposed development footprint does not fall within a Renewable Energy Development Zone.**

Radio Frequency

- The **Medium** Radio Frequency Interference (RFI) theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being **Low**.
- Although the site area falls within an Astronomy Advantage Area (AAA) under the Astronomy Geographic Advantage (AGA) Act, 2007 (Act No. 21 of 2007), the South African Radio Astronomy Observatory (SARAO) undertook a high-level impact assessment and determined that the project represents a low risk of interference to the SKA radio telescope (including MeerKAT) with a compliance surplus of 57.02 dBm/Hz. (Response Letter from Mr Selaelo Matlhane, Spectrum & Telecommunication Manager of the South African Radio Astronomy Observatory (SARAO) and dated 16 March 2022)

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Protected Areas

- Study area is not within a protected area or within 5 km of a protected area according to the Protected Area Register (PAR).
- The study area is not within the core area or within 5 km of the core area of a Biosphere Reserve according to the PAR.
- The study area is not within a National Protected Area Expansion Strategy Focus Area according to the National Protected Area Expansion Strategy (2016).
- The study area is not within a sensitive area in terms of an EMF as there is no EMF.

Physical aspect:

Atmosphere

- The study area is not within an Air Quality Priority Area.

Geology

- According to the 1:1 000 000 series geology map for the area (ESRI Geology Map Series, 2022), the geology of the study area is underlain by flat-lying sedimentary rocks of the Karoo Supergroup, which have been intruded by innumerable sills and dykes of dolerite (Hydrology Assessment).

Wetlands

- The study area is not within an area identified in terms of an international convention, such as a RAMSAR site.
- The project area contains (National Freshwater Ecosystem Priority Areas) “Wetlands and Estuaries” (Screening Report). Based on available National Wetland Freshwater Ecosystem Priority Areas (NFEPA) (Van Deventer, 2018) the non-perennial drainage streams associated with the site are classified as riverine wetland systems (to be confirmed by the wetland assessment report – not part of this study) (Hydrology Assessment).

Surface Water (Hydrology)

- The project area is located within a Strategic Water Source Area.
- The project area falls within quaternary catchment D62D and the Orange Water Management Area. (Hydrology Assessment)
- The ephemeral drainage line running through the project area is an unnamed tributary to the D62D – 05610 tributary with its confluence just downstream of the Project Area. (Plan of Study prepared by Dr Andrew Deacon)
- The project area contains 3 Hydrological Response Units (HRU). Ninety-six percent (96%) of the project area falls within HRU2. The average slope of HRU2 (21,738 km2) is 0,56%. Sixteen percent (16,51%) of HRU2 has a 3-10% slope, which is mostly restricted to the western and eastern corners of the project area. Consequently, the topography of the study area is generally flat with elevations on the site typically ranging from 1 335 to 1 370 m above mean sea level. (Hydrology Assessment)

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- Drainage is generally towards the north-west via multiple non-perennial drainage lines towards the ephemeral Brak River, approximately 6,6 km further downstream. (At least) Three small capacity in-stream dams occur within the development area. (Hydrology Assessment)
- However, the drainage channels or flow paths are not clearly defined. Sheet flow occurs from micro sub-catchments towards lower topographical areas or isolated depressions forming temporarily flooded areas. Irregular occurrences of ponded water were visible across the project area, even in areas with no defined drainage lines or stream channels. (Hydrology Assessment)
- In the absence of clearly defined drainage channels or streams the area is prone to exhibit ponded flood occurrence zones. Micro sub-catchment sheet flow towards lower-lying areas within the non-perennial river flood plains is likely to dominate flood propagation, and isolated flooded areas are predicted to occur. The flood line determination suggests a low flooding risk as no clearly defined drainage lines occur. As such, no clearly defined exclusion zones or protection buffer areas could be mapped or recommended. (Hydrology Assessment)
- The project area falls within a spring to summer rainfall area (October to April), ranging from 112,4 to 738,9 mm/yr but averaging 320 mm/yr. The Mean Annual Evaporation (2 000 – 2 150 mm/yr) exceeds the Mean Annual Precipitation (MAP) by about 85%, so non-perennial streams and rivers will only have water when there are flooding events. (Hydrology Assessment)
- Considering run-off is directly related to rainfall intensity, and longer precipitation events, both monthly rainfall and run-off, peak from January to April. The run-off during these peak months, ranges from 0,3 to 1,1 mm/yr over the surface area of quaternary catchment D62D. The annual run-off from natural (unmodified) catchments in D62D is approximately 0,9% of the MAP. (Hydrology Assessment)
- Accounting for changes in soil type, slope angle and rainfall intensity, ground cover beneath solar arrays was found to have the most significant impact on run-off rates. So, if vegetation cover beneath the solar arrays is maintained, no significant increase in surface water run-off (run-off volumes, peak rates or time to peak rates) is anticipated compared to greenfield run-off rates. (Hydrology Assessment)

Groundwater (Geohydrology)

- De Aar is dependent on groundwater for agriculture and drinking water (District Municipality's Climate Change Response Plan).
- Almost a third of the households in Ward 6 get their water from a borehole, a much higher proportion than on local, district or provincial level, while just over 60% get their water from a regional or local water scheme (much lower than on local, district or provincial level). (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- The project area overlies a moderate to high yielding aquifer (median yields of 0,5 to 2 L/sec), on average 6,9 m below ground level, and generally in bedding planes in shale or interbedded sandstone of the Beaufort Group and jointed and fractured contact zones between sedimentary rocks and dolerite dykes. (Hydrology Assessment)
- However, the landowner, Willem Retief has indicated that each windmill pump yields approximately 1 200l/hr from both (two) boreholes in the project area for Phase 3. This is equivalent to 0,33 L/s, which falls at the bottom of the range (0.5 – 2L/s – Class D3 Intergranular & Fractured Aquifer System) that is

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considered the median aquifer yield of the project area (Meyer, P.S., Chetty, & T., Jonk, F., 2002). Furthermore, Willem observed the water table dropped by at least 3 ms over the last few years during the drought.

- The electrical conductivity (EC) for the underlying aquifers generally ranges from 70 to 300 mS/m and the pH ranges from 6 to 8. Consequently, groundwater can generally be used for domestic and recreational use. (Hydrology Assessment)
- Water scarcity in the arid Pixley Ka Seme District Municipality is expected to be exacerbated by climate change, specifically drought. Most of the province receives minimal summer rainfall ranging from 50 mm to 400 mm depending on the location. Under a low climate change mitigation scenario (Climate Change Adaptation Response Strategy for the Northern Cape, 2016), model simulations indicated an average temperature increase by 2.3 °C, an increase of 16.1 in the total number of heat waves experienced and a decrease in rainfall to 17 mm - 74.3 mm annually.

Terrestrial Biodiversity

- The **Very High** Terrestrial Biodiversity theme according to the Screening Report and owing to the study area being within an ESA – Northern Cape CBA Map (2016) (SANBI BGIS), was confirmed in the Site Sensitivity Verification Report. ESAs must be in a systematic biodiversity plan adopted by the CA or a bioregional plan. The Critical Biodiversity Areas of the Northern Cape: Technical Report (2016) by Dr Stephen Holness & Enrico Oosthuysen, has been adopted (pers. comm. Elsabe Swart, DENC). There is no Bioregional Plan for the Pixley Ka Seme District Municipality District (pers. comm. Elsabe Swart, DENC).
- **Why was this area identified as an ESA... what ecological processes do we need to take into consideration?**

  ESAs are meant to support the ecological functioning of CBAs through its provision of supporting ecological processes (along ecological process pathways) or even meet biodiversity targets for ecological processes that have not been met in the CBA. So, ESAs and CBAs are inextricably linked. Logically then, the nature and life history strategies of the biodiversity features (- that are the subject of the biodiversity targets, which need to be met in a CBA) will influence the nature of the supporting ecological processes that need to be protected in the ESA. As long as a person doesn't know what ecological processes (and pathways) need to be protected, one cannot assess the impacts of the proposed solar facility on this ESA and come up with appropriate mitigations, to avoid, minimise, etc., and then determine the residual impact.

  Answer

  "The Northern Cape CBA Map identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) which, together with protected areas, are important for the persistence of a viable representative sample of ecosystems and species, as well as the long-term ecological functioning of the landscape as a whole. The "reasons" layer is based on the planning units used in the spatial analysis and provides a list of biodiversity and ecological features found in each planning unit, which contribute to the biodiversity target." (**Northern Cape CBA "reasons" spatial data, SANBI BGIS**)

  The planning units that occur on the Phase 3 study area (Unit ID: 5605, 5701, 5702, 5798 and 5895) have the following biodiversity features:

  - Eastern upper Karoo veg type
  - Northern Cape Upper Karoo veg type

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- IBA area
- NFEPA wetlands and rivers
- FEPA catchment

Aquatic Biodiversity

- The **Very High** Aquatic Biodiversity theme according to the Screening Report and owing to the study area being within a Strategic Water Source Area, as well as (National Freshwater Ecosystem Priority Areas) "Wetlands and Estuaries", was confirmed in the Site Sensitivity Verification Report.

Table 10. Applicable biodiversity features or other sensitivity categories with definitions and desired management objectives.

Biodiversity Feature	Description	Desired State and compatible land uses
ESA – Technical Guidelines for CBA Maps (2017) (SANBI)	An ESA is an area that must retain its ecological processes in order to: • meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; • meet biodiversity targets for representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs; • support ecological functioning of a protected area or CBA (e.g., protected area buffers); or a combination of these). See **Figure 1** below.	To be managed to maintain near natural landscapes with minimal loss in ecosystem integrity and functioning. Spatially explicit corridors must be managed to maintain function and structure, especially for aquatic systems. Buffers to be managed to limit transformation with particular emphasis on maintaining ecological process that require large areas. For ESAs currently in good or fair ecological condition: Maintain in at least fair (semi-natural) condition. For ESAs currently in severely modified ecological condition: No further deterioration in ecological condition (e.g., through intensification of land use).
Strategic Water Source Area.	Strategic Water Source Areas (SWSAs) are defined as areas of land that either: (a) supply a disproportionate (e.g., relatively large) quantity of mean annual surface water runoff in	The protection and restoration of strategic water source areas is of direct benefit to all downstream users. This dependence needs to be considered in decisions relating to these primary headwater catchments.

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	relation to their size and so are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland.	The protection of both water quantity (flows) and quality must be addressed. Any failure to address impacts on water quality or quantity will have impacts on the water security of all those depending on that water downstream. Groundwater is the main or only source of water for numerous towns and settlements across the country so protecting the capture zone, specifically for municipal supply well-fields, the recharge area, and the integrity of the aquifers is important as well.
NFEPA Rivers and Wetlands	NFEPA River - achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species, and were identified in rivers that are currently in a good condition NFEPA Wetland - important or sensitive wetlands and wetland clusters that are required to achieve biodiversity targets	Their FEPA status indicates that they should remain in a good condition to contribute to national biodiversity goals and support sustainable use of water resources. Wetland FEPAs currently in a good ecological condition should be managed to maintain this condition. Those currently not in a good condition should be rehabilitated to the best attainable ecological condition.

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CBA Map category	Description	Desired state	Examples of compatible land uses
Protected area	Areas that are formally protected in terms of the Protected Areas Act. Each protected area has a management plan.	As per each protected area's management plan.	• Conservation-related land uses
Critical Biodiversity Area 1 (CBA 1)	Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas.	Maintain in natural or near natural ecological condition.	• Open space • Low impact ecotourism or recreation
Critical Biodiversity Area 2 (CBA 2)	Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.		
Ecological Support Area 1 (ESA 1)	Areas that support the ecological functioning of protected areas or CBAs, or provide important ecological infrastructure.	Maintain in at least semi-natural ecological condition.	• Low impact ecotourism or recreation • Sustainably managed rangelands • Certain forms of low density housing
Ecological Support Area 2 (ESA 2)		No further intensification of land use.	• Intensive agriculture
Other natural area (ONA)	Natural or semi-natural areas that are not required to meet biodiversity targets or support natural ecological processes.	Best determined through multi-sectoral planning processes.	From a biodiversity perspective, these areas can be used for a range of intensive land uses
No natural remaining (NNR)	Areas in which no natural habitat remains.		

Figure 5: CBA Map category descriptions and desired state with associated land uses (Technical Guideline for CBA maps – SANBI, 2017).

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Biological aspect:

Ecosystem/Vegetation Type

- The De Aar area falls within the Nama Karoo biome.
- Not a critically endangered or endangered ecosystem in terms of SANBI's latest NBA (2018). The ecosystem threat status as per the NBA 2018 data provides a holistic view of the vegetation type, the threatened species associated with the ecosystem and the overall land use currently in the area. The National vegetation type is Northern Upper Karoo and is considered Least Threatened in the National List of Threatened Ecosystems (NBA, 2018). However, the Ecosystem Protection Level for the Northern Upper Karoo is categorised as Poorly Protected Ecosystem (NBA, 2018). Less than 2,9% of the area is statutorily conserved (protected), compared with the national conservation target of 21%. Although none of this vegetation type is conserved in statutory conservation areas, very little has been cleared for cultivation or irreversibly transformed (99,7% Remaining) through human settlement or infrastructure development. (Visual Assessment)

Bats

- The layout of the solar footprint could fall into sensitive bat areas which should be avoided or mitigated. Limited data has indicated that bat activity over a solar development was lower than over the natural areas. The impact of the development extends beyond the alteration of habitat and available resources that would affect bat activity, abundance and diversity but during the operational phase, the impacts of artificial light pollution (flood lights for security reasons), associated with the solar project, could change behaviour and abundances of bat species within the bat community including alteration of commuting routes and preferred foraging habitat. (Plan of Study prepared by Dr Dawn Cory-Toussaint)

Important Bird Area

- The **Low** Avian theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being at least **High**.
- A relatively high diversity of 128 bird species for the area has been recorded within the 4 SABAP pentads in which the study area is situated. During the March 2022 site visit, a total of 69 species were recorded within the 4 pentads. A total of 24 priority species (e.g., rare, SA endemic) are expected to occur within and surrounding the study area. Fourteen (14) of these species have medium to high occurring probability (POC) on the site. Thirteen (13) of the 24 priority species are listed as threatened and near threatened. Seven (7) of these regionally/globally threatened and near-threatened species were observed during the site visit, including Ludwig's Bustard, Blue Crane, Martial Eagle, Verreaux's Eagle, Lanner Falcon, Karoo Korhaan, and Secretary Bird. (Avifauna Scoping Report and Plan of Study prepared by Enviro-Insight cc and dated April 2022)
- The study area is within an Important Bird Area (IBA) called Platberg-Karoo Conservancy (unprotected). The following information was taken off the BirdLife website (https://www.birdlife.org.za/iba-directory/platberg-karoo-conservancy - page last updated Friday 13th February 2015).

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IBA trigger species

- Globally threatened species are Blue Crane, Ludwig's Bustard, Kori Bustard, Secretary bird, Martial Eagle, Blue Korhaan, Black Harrier (*Circus maurus*) and Denham's Bustard (*Neotis denhami*). Regionally threatened species are Black Stork, Lanner Falcon (*Falco biarmicus*), Tawny Eagle, Karoo Korhaan and Verreauxs' Eagle.
- Biome-restricted species include Karoo Lark (*alendulauda albescens*), Karoo Long-billed Lark (*Certhilauda subcoronata*), Karoo Chat (*Cercomela schlegelii*), Tractrac Chat (*C. tractrac*), Sickle-winged Chat (*C. sinuata*), Namaqua Warbler (*Phragmacia substriata*), Layard's Tit-Babbler (*Sylvia layardi*), Pale-winged Starling (*Onychognathus nabouroup*) and Black-headed Canary (*Serinus alario*). Congregatory species include Lesser Kestrel and Amur Falcon.

Conservation Issues/Threats

- Renewable energy developments are a new threat. Thirteen wind and solar developments have been approved for development within this IBA. All the large trigger species are highly susceptible to collisions with wind turbines, as are large flocks of Lesser Kestrels and Amur Falcons. All the trigger species are predicted to be moderately susceptible to the various impacts of solar-energy facilities.
- Numerous existing and new power lines are significant threats to trigger species. Power lines kill substantial numbers of all large terrestrial bird species in the Karoo, including threatened species (Jenkins et al. 2011, Shaw 2013). The planned Eskom central corridor for future power-line developments includes the northern half of this IBA. There is currently no completely effective mitigation method to prevent collisions.
- Climate change scenarios for the region predict slightly higher summer rainfall by 2050, and increased rainfall variability. Droughts are expected to become more severe. The Blue Crane's diet depends largely on the timing and amount of rainfall, and climate change is predicted to have both positive and negative consequences for its populations. Increased summer rainfall could improve survival, and conversely drought years can lower long-term average survival. Large, mainly resident species dependent on rainfall are also more vulnerable to climate change. This would include the slow-breeding Verreauxs' Eagle, Tawny Eagle and Martial Eagle, which also exhibit extended parental care. Severe hailstorms kill hundreds of roosting Lesser Kestrels and Amur Falcons and could become more frequent.

Conservation actions

- The major threat of power-line collisions was initially investigated by the Eskom/EWT partnership and MD Anderson, including the impact of power lines on populations of large terrestrial bird species and evaluated the effectiveness of earth-wire marking devices (Eskom's Transmission Bird Collision Prevention Guideline - Revision 1 and Eskom's Utilization of Bird Flight Diverters on Eskom Overhead Lines (Revision 1) authorised date July 2015).

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  - Ludwig's Bustard was listed as globally Endangered on the IUCN Red List in 2010 as a result of potentially unsustainable collision mortality, but there is no evidence for a population decrease over the past 20 years despite extremely high annual power line mortality rates (41% of the Ludwig's Bustard population) (Shaw, J. 2013. Power line collisions in the Karoo conserving Ludwig's bustard. University of Cape Town).
  - This species is classified as Endangered as the population is projected to have undergone a very rapid population decline due to collisions with power lines, a trend which is set to continue into the future as the power grid in southern Africa expands and successful mitigation measures are yet to be implemented (BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 30/03/2022; http://datazone.birdlife.org/species/factsheet/ludwigs-bustard-neotis-ludwigii.

- The **Medium** Animal Species theme according to the Screening Report and owing to the presence of *Aves-Neotis ludwigii*, was confirmed in the Site Sensitivity Verification Report.
- The **Low** Plant Species theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being at least **High**.

Table 11. Applicable biodiversity features or other sensitivity categories with definitions and desired management objectives.

Biodiversity Feature	Description	Desired State and compatible land uses
Important Bird Area Platberg-Karoo Conservancy (unprotected)	IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria. Essentially, these are the most important sites for conserving.	IBAs are sites for conservation action and obtaining formal protection. Activities in IBA should be aligned to conservation outcomes of the protected area and should include developments such as low-impact eco-tourism.
Aves-Neotis ludwigii (EN) BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 30/03/2022 (http://datazone.birdlife.org/species/factsheet/ludwigs-bustard-neotis-ludwigii)	Endangered and Vulnerable species in terms of the Conservation of Nature (IUCN) Red List of Threatened Species. Levels of threat are determined against quantitative threshold-based criteria. South Africa uses the latest version of the IUCN Red List Categories and Criteria, version 3.1. (IUCN, 2012a). Protection level of species measures progress towards effective protection of a population persistence target	Building solar arrays (a linked assembly of heliostats) outside known water bird flightpaths. Constructing new powerlines in such a way that they have minimal impact on birds (e.g., bird-friendly designs, appropriate wire marking devices).

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	for each species. The indicator consists of two components: (1) The first measures how well represented each species is within the protected area network, based on the number of individuals of a species or area of suitable habitat protected relative to the persistence target set for that species. (2) Component two includes a measure of how well a protected area is mitigating threats to each species and when combined with protected area representation provides an overall (effective) protection level measure for each species.	

Social aspect:

- The project area is located in Ward 6 of the Emthanjeni Local Municipality that is located in the Pixley Ka Seme District Municipality in the Northern Cape province. The towns in the area are small and the proposed site is located between the towns of Hanover and De Aar. About 74% of the people in Ward 6 live in urban areas while the remaining 26% (one quarter) live on farms. There are no areas under traditional leadership in the district and the site is surrounded by commercial farms. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- At a local municipal level, the number of households increased (between 2011 and 2016) along with population density (per km^2), but the average household size has decreased (more households but with fewer members) possibly due to children leaving home and starting families of their own. Almost half the population in Ward 6 and the local municipality is 24 years or younger. Such a young population places a lot of pressure on resources and infrastructure of the area, and a great demand for future infrastructure as well as the creation of livelihoods can be expected. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- The intensity of poverty and the poverty headcount is used to calculate the SAMPI score. A higher score indicates a very poor community that is deprived on many indicators. Despite a slight decrease in poverty intensity (average proportion of indicators in which poor households are deprived), the increased poverty headcount (the proportion of households that can be defined as multidimensionally poor) at a local municipal level, has effectively doubled the SAMPI score from 0,01 in 2011 to 0,02 in 2016. This means that more households are deprived on a number of dimensions that mostly relate to access to basic services. Education levels are low (About two fifths (17,8%) of the people in Ward 6 aged 20 years or older have no schooling or only some primary education). In Ward 6, 45,3% of people aged between 15 – 65 years are employed, with about half of those people in the formal sector. Ward 6 has the

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lowest proportion of people (6,7%) with no annual household income. There are very few employment opportunities. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)

- The South African Multidimensional Poverty Index (SAMPI) (Statistics South Africa, 2014) assess poverty on the dimensions of health, education, standard of living and economic activity using the indicators child mortality, years of schooling, school attendance, fuel for heating, lighting, and cooking, water access, sanitation, dwelling type, asset ownership and unemployment. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)

Visual

- The **Very High** Landscape (Solar) theme according to the Screening Report and owing to the eastern-most corner of the study area falling within "mountain tops and high ridges" was confirmed in the Site Sensitivity Verification Report.
    - Furthermore, a neighbouring landowner has submitted written objections to the proposed activity for *inter alia* the visual impact or massing from 3.3 m solar PV panels located 50m from his farm boundary ('massing' refers when the landscape becomes dominated by a particular theme – in this case, large covering of solar PV panels that result in strong change to the local landscape character).

Civil

- The **Low** Civil Aviation theme according to the Screening Report and owing to no major or other types of civil aviation aerodromes was confirmed in the Site Sensitivity Verification Report.

Defence

- The **Low** Defence theme according to the Screening Report was confirmed in the Site Sensitivity Verification Report.

Economic aspect:

- The study area is zoned as Agriculture Zone 1 (not open space or conservation).
- Agriculture (mostly 'Karoo' mutton, sheep and wool, with some hunting of small game) forms the backbone of the economy of the Emthanjeni LM and accounts for the largest labour/employment contributor to date. (Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022)
- The **Medium** Agriculture theme according to the Screening Report was disputed in the Site Sensitivity Verification Report in so far as an Agriculture Agro-Ecosystem Specialist Assessment shall be undertaken instead of a Compliance Statement, to make management recommendations that will benefit current agricultural activities as it is the applicant and landowners' intention to undertake an 'Agrivoltaic' system that combines extensive grazing (or sheep) and solar farming.

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Heritage and cultural aspect:

Archaeology

- The study area is not within a World Heritage Site or within 10 km of a World Heritage Site according to the PAR.
- The **Low** Archaeological and Cultural Heritage theme according to the Screening Report was disputed in the Site Sensitivity Verification Report as being **High**.
- Previous archaeological and heritage assessments for Phase 1 recorded a fairly large number of cultural heritage (archaeological & historical) resources of varying extent and significance in the area. These include scatters of open-air surface Stone Age sites, rock engravings, later agro-pastoralist stone-walled sites, as well as historical Anglo-Boer War (18990-1902) sites. These findings are clear evidence of the intrinsic heritage value of the area and the fact that further assessments would be required. (Plan of Study prepared by Anton Pelser of APELSER Archaeological Consulting dated 18 March 2022)

Palaeontology

- The **Very High** Palaeontology theme according to the Screening Report was confirmed in the Site Sensitivity Verification Report.
- The project area is underlain at depth by potentially fossiliferous continental bedrocks of the Lower Beaufort Group (Karoo Supergroup) of Middle Permian age that have yielded sparse but scientifically important vertebrate remains in the Hanover area as well as commoner petrified wood. Also present are unfossiliferous dolerite intrusions and Late Caenozoic superficial sediments (e.g., alluvium, surface gravels) which might contain important fossil mammal and other remains as well as reworked fossil wood blocks. Satellite imagery suggests that bedrock exposure is limited but not insignificant within all three study sites. *Dr. John Almond, NATURA VIVA cc Palaeontological Impact Assessments & Heritage Management, Natural History Education, Tourism, Research Budget Proposal dated 20 January 2022.*
- “The most likely outcome, based on comparable project areas in the Hanover - De Aar region of the Great Karoo, is that comparatively few scientifically useful fossil sites will be recorded, while No-Go palaeontological areas are very unlikely to be designated. Most Karoo fossil sites are of limited extent and can be effectively mitigated in the pre-construction phase, so palaeontological constraints on the project footprint are not anticipated, although they cannot be completely excluded in advance.” *Dr. John Almond, NATURA VIVA cc Palaeontological Impact Assessments & Heritage Management, Natural History Education, Tourism, Research Budget Proposal dated 20 January 2022.*

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Identification (and assessment) of impacts and risks for each alternative

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(v) ***the impacts and risks which have informed the identification of each alternative, including*** *the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts - (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;*

(vii) ***positive and negative impacts that the proposed activity and alternatives will have*** *on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*

(viii) ***the possible mitigation measures*** *that could be applied and level of residual risk.*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Please refer to the impact assessment of the preferred alternative and no-go option in **Appendix D**.

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The Methodology

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(vi) ***The methodology used in identifying and ranking*** *the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks with* ***the alternatives****;*

(h) A plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(iv) ***a description of the proposed method of assessing the environmental aspects****, including aspects to be assessed by specialists, and*

(v) ***a description of the proposed method of assessing duration and significance****;*

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Ecoleges sets out to identify, predict and evaluate impacts and risks firstly by identifying the activities that are to be undertaken during the development, and where applicable, related operation of a listed or specified activity. Once the activities and associated environmental aspects, or elements of the contractor's activities that interact or can interact with the environment, are identified, e.g., air emissions, it is possible to identify the potential environmental impact and risks, considering that an impact is any change to the environment resulting from the contractor's environmental aspects. This process of identification is facilitated by a Leipold Matrix, which considers the possible outcomes of each aspect and the cause of that aspect (or activity) within the context of the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment. Other critical inputs are received from Interested & Affected Parties, and, where applicable, the findings contained in specialist studies.

Impacts versus Risks

It is our opinion that a risk is nothing more than a potential impact, meant to encourage people to think beyond the obvious impact and consider (1) variable driving forces, and (2) uncertain outcomes, to identify potential or indirect impacts so that specific actions can be taken in response to that risk.

(1) Variable driving forces

Some variable driving forces include nature, human behaviour, and exposure scenario.

An **environmental aspect** is described in BS EN ISO 14001 as an "element of an organisation's activities, products or services that interacts or can interact with the environment"

An **environmental impact** is an "adverse or beneficial change to the environment resulting from the organization's environmental aspects."

For example, if an activity is driving a covered coal truck on a surfaced road, then one aspect of that activity is emissions to air, including greenhouse gases, and the impact is global warming. If a person changes the exposure scenario to a dirt road, then another emission to air is dust, and the potential impacts or risks

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include dust fall on vegetation, and the inhalation of dust by people. It would not have been possible to identify the potential risks if one did not consider an alternative exposure scenario.

(2) Uncertain outcomes

Uncertain outcomes relate to the nature and extent of an outcome most often because of a lack of information, data or understanding about, for example, stressors, responses and distributions over space and time.

For example, a lack of meteorological data would make it difficult to assess the affects of wind on dust emissions, and how it can influence the certainty of the impact.

So, the determination of an impact versus risk is based on whether an activity can be exposed to variable driving forces or generate uncertain outcomes. The methodology used in assessing impacts and risks is the same as described below. However, the legislated precautionary principle is adopted when identifying mitigations for risks.

Motivation for the methodology

A **significant impact** means, "an impact that may have a notable effect on one or more aspects of the environment, or may result in non-compliance with accepted quality standards, thresholds or targets, and…"

According to the EIA Regulation's definition, there are two measures of significance: (1) a notable effect on the environment, and (2) non-compliance with standards, thresholds, or targets.

(1) A notable effect on the environment

An impact can be significant based on a measurable effect to the environment.

(2) Non-compliance with standards, thresholds, or targets

An impact can be significant based on non-compliance, which is basically a failure to act in accordance with formal requirements such as a law, regulation, term of a contract, rule or in this context, environmental standards, thresholds, and targets.

(a) An example of a standard is the General Authorisation for Section 21(f) water uses relating to the "discharge of waste or water containing waste into a water resource…" published in GN No. 665 of 2013. It contains a table of wastewater limit values applicable to the discharge, including such parameters as Chemical Oxygen Demand, pH, Suspended Solids, and the concentration of other dissolved elements.
(b) An example of a threshold is 300m^2 in the case of Listed Activity 12 of Listing Notice 3 relating to the clearance of indigenous vegetation in an identified geographical area.
(c) An example of targets are the biodiversity targets for ecosystems, species, or ecological processes that CBAs are required to meet.

Consequently, the methodology differentiates between two measures of significance, namely **Impact Magnitude** and **Impact Importance**. Impact Magnitude relates to a notable effect on the environment and Impact Importance refers to non-compliance. Significance is assessed using both approaches. If either one is, or both are, significant, then the impact is significant. However, **Impact Importance** prevails over **Impact Magnitud**e. In other words, a significant magnitude is deemed to be at a cost that is acceptable to society in large IF the importance is Low.

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Each approach entails assigning ranks, usually Low, Medium, or High, to a set of judgemental criteria, that is criteria that are based on clearly defined value judgements (or descriptors) that have been adapted to the South African EIA context.

This requirement is written into the second part of the EIA Regulation's definition of **significant Impact**. It continues, "…and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as **duration**, **magnitude**, **intensity** and **probability** of occurrence."

So, not only does the definition identify four key criteria that we need to consider, but it also requires that these criteria are ranked, implying levels of severity determined by the EAP's judgement.

Additional criteria identified by the EIA Regulations (see Resources used to inform methodology above) for inclusion in the assessment process include **nature**, **significance**, **consequence**, and **extent**.

In total, eight different criteria must be taken into consideration when undertaking an impact and risk assessment. However, which criteria should be used to evaluate **Impact Magnitude** and which criteria should be used to evaluate **Impact Importance**?

Description of the criteria

The "**Nature**" of something means the basic or inherent features, character, or qualities of something. However, considering that identified potential environmental impacts should as far as possible be quantified, the nature of an impact should be evaluated by predicting those attributes that are measurable, or at least prone to minimal subjectivity during their judgment, such as intensity, extent, duration, and status.

The "**Status**" of an impact identifies whether it is a positive (or beneficial), negative (or adverse), or neutral impact. Status is not mentioned as a criterion in the EIA Regulations, 2014 as amended, but the Regulations do refer to the inclusion of both positive and negative effects. So, status has been incorporated into the assessment process as a criterion and specifically with reference to evaluating the nature, or determining the inherent qualities, of an impact.

In summary, nature is a composite score that combines four different impact values: (1) **intensity** or severity, (2) geographic **extent** or spatial scale, (3) **duration** (and if applicable frequency), and (4) status.

Once the nature of an impact has been considered together with the **probability**, likelihood of occurrence or, also called, degree of certainty, then a person will arrive at **Impact Magnitude**, which is a separate and standalone measure of significance.

The other measure of **significance** is Impact Importance. Impact importance is effectively a value judgement placed on the degree of change by affected parties and is determined by combining a criterion called "**Level of Acceptability**" with the probability or likelihood of exceeding a threshold of sorts.

Although the Level of Acceptability is not identified as a criterion in the EIA Regulations, it is alluded to in the definition of "significant impact" as non-compliance with standards, thresholds, or targets, e.g., non-compliance with a threshold is unacceptable, and if highly probable, then it constitutes a significant impact.

In fact, the Level of Acceptability is very likely synonymous with, and achieves the same intent as, "**Consequence**."

A single impact can have multiple consequences, e.g., the consequences of global warming are many, ranging from rising sea levels to earlier flowering seasons. So, consequence is an extension of impact.

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Some consequences may be significant. Some may be insignificant. It is simply not possible to pick up on any significance if not by considering all the context-specific consequences. Therefore, considering that potential consequences are so many and varied, the only way of ranking a consequence is through its level of acceptability.

The Level of Acceptability criterion measures the degree of change in an environmental resource against (1) quantitative thresholds provided by legal requirements and scientific standards, and which represent that point at which a project's potential environmental effects become significant, and (2) qualitative thresholds of social acceptability informed by *inter alia* the Public Participation Process.

Furthermore, the Level of Acceptability criterion, if considered properly in its formulation, also allows for the findings from undertaking a need and desirability to be brought into the impact and risk assessment process, e.g., the answers to the questions in the Need and Desirability Guideline document should be used to inform the Level of Acceptability for applicable impacts.

Value Judgement

Significance, being an anthropocentric concept, is a value judgement, dependant on the nature of the impact expressed in terms of both biophysical and socio-economic values (**Impact Magnitude**), and its acceptability to affected communities (**Impact Importance**).

Considering value judgements can vary greatly amongst different stakeholders, professional judgement, such as that of the EAP, shall be used in conjunction with the different value judgements expressed by various stakeholders. In other words, significance shall be communicated from a variety of perspectives other than the professional opinion of a multidisciplinary study team, and include environmental, socio-economic, or cultural attributes perceived by society to be significant. Despite the potential variety of perspectives, they can be categorized into three broad forms of recognition for determination of impact significance, namely institutional (laws, plans or policy statements), public and technical (scientific or technical knowledge or judgement of critical resource characteristics) (DEAT 2002). Consequently, thresholds of significance were as far as possible based on / determined by reference to legal requirements, accepted scientific standards or social acceptability (**Table 15**).

Significance is relative and must always be set in a context to show whose values they represent. The selected criterion, "Level of Acceptability," provides such a context, taking all three forms of recognition into account by asking whether impacts are legally, publicly, and professionally recognized as important.

Natural environmental, socio-economic, and cultural heritage impacts were identified systematically by considering how the activities to be undertaken during the development phase will interact with all elements of the receiving environment, as well as inputs received from I&APs and specialists.

Once identified, natural environmental, socio-economic, and cultural heritage impacts were then assessed using the approach outlined below. All impacts, including those identified by I&APs and Specialists, are measured against the current land-use activity (the no-go option / option of not implementing the activity) and assessed by ranking a suite of generic criteria. The criteria, as well as the descriptors that are used to assign specific rankings for each criterion, provide a consistent and systematic basis for the comparison and application of judgements. Consequently, this methodology has been distributed to the specialists to avoid inconsistency between the EAP and specialists when determining impact significance.

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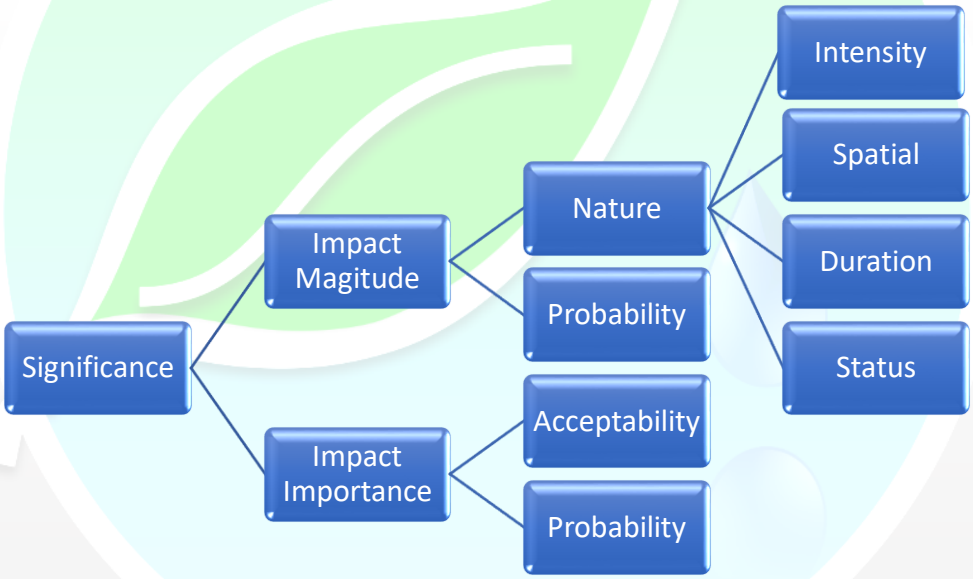
Methodology

The methodology comprises two phases: (1) Phase 1 involves an assessment of significance without mitigation, and (2) Phase 2 involves an assessment with mitigation. If the outcome of a Phase 1 assessment is not significant, then the impact(s) are omitted from further assessment. However, if either or both Impact Magnitude and Impact Importance are significant, then the impact needs to proceed to the Phase 2 assessment. During Phase 2 either or both Significance ranks (Impact Magnitude and/or Impact Importance) are considered together with the following three criteria to determine whether a phase 1-assessment should be repeated with mitigation or whether the proposed activity needs to be refused or redesigned: Reversibility, Irreplaceable Loss of Resources, and Mitigatory Potential.

Important Note: Non-significant impacts are omitted from further assessment, that is no phase 2-assessment. There is one exception, that is impacts with a positive **Status**. Impacts with a positive status are assessed according to their mitigatory potential to identify further opportunities for enhancing positive effects.

(1) Phase 1-Assessment without mitigation



Impact Magnitude and Impact Importance ratings are predicted as described below. However, the outcomes of the phase 1-assessment (rankings) should still be verified within the context of the descriptors described in **Table 12**.

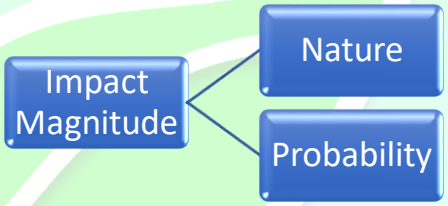
Table 12. Significance Criterion (Impact Magnitude and Impact Importance Rating).

Ranks	Description
High	• Of a substantial or the highest order possible within the bounds of impacts that could occur. • In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. • Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt.

Medium	• Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. • In the case of adverse impacts, mitigation is both feasible and easily possible. • Social, cultural, and economic activities of communities are changed, but can be continued (albeit in a different form). • Modification of the project design or alternative action may be required. • In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
Low	o impact or impact is of a low order and therefore likely to have little real effect. he case of adverse impacts, mitigation is either easily achieved or little will be required, or both. ial, cultural, and economic activities of communities can continue unchanged. he case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, e effective and less time-consuming.

(a) **Impact Magnitude (Significance)**

Impact Magnitude is a composite score that is made up of the following two criteria: (1) Nature (composite score), and (2) Probability, likelihood of occurrence or degree of certainty.



The possible composite scores for Impact Magnitude are:

IMPACT MAGNITUDE		Probability		
		High	**Medium**	**Low**
Nature	**High**	±1	±1	±0
	Medium	±1	±1	±0
	Low	±0	±0	±0

Assumption: If the Nature and/or Probability is low, then Impact Magnitude is non-significant.

Significant	±1	Non-significant	±0

i. **Nature**

Nature is a composite score that is made up of the following four criteria: (1) Intensity or severity, (2) Geographic extent or spatial scale, (3) Duration and frequency, and (4) Status (positive/beneficial, negative/adverse, or neutral).

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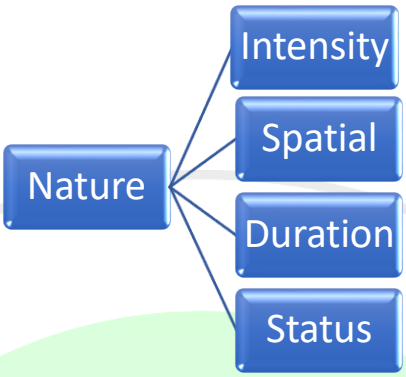

The possible composite scores for Nature are:

Nature		Intensity		
		High	**Medium**	**Low**
Spatial and Duration	**High**	±1	±1	±1
	Medium	±1	±1	±1
	Low	±1	±1	±0

Assumption: if any one of the criteria are Medium or High, then Nature is significant.

Significant	±1	Non-significant	±0

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Table 13. Criteria used in evaluating Impact Magnitude (Significance).

Criteria	Ranks and Descriptors		
	Low	**Medium**	**High**
Intensity or Severity	• No disturbance or the disturbance of degraded areas, which have little conservation value. • Zero to a minor change in species occurrence or variety. • Natural function and processes are not affected, or if affected, then not modified. • Social, cultural, and economic activities of communities can continue unchanged, or they are changed, but can be continued (albeit in a different form) without stakeholder consultation.	• Disturbance of areas that have potential conservation value or are of use as resources. • Moderate change in species occurrence and variety. • Modified processes will continue. • Social, cultural, and economic activities of communities are changed, but can be continued (albeit in a different form) with stakeholder consultation.	• Disturbance of pristine areas that have important conservation value. • Complete change in species occurrence and variety/Destruction of rare or endangered species. • Functioning of processes will cease. • Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt. • Sensitive environmental receptors with a low capacity (tolerance) to accommodate the change.
Geographical extent or special scale (the boundaries at local and regional extents will be different for biophysical and social impacts)	• Within site boundary. • Distribution within a population. • Within one property.	• Beyond site boundary. • Distribution across populations • Traverses several properties. • Local area.	• Widespread. • Far beyond site boundary. • Distribution across ecosystems • Crosses municipal or provincial boundaries. • Regional, national international scale.
Duration and frequency (Long term (High), Medium term (Medium), Short term (Low))	• Immediate, once-off • Temporary - quickly reversible. • Less than the project lifespan. • 0 to 5 years (or for rehabilitation <1yr, restricted to a season).	• Delayed, intermittent • Temporary - reversible over time. • Lifespan of the project. • 5 to 15 years (or for rehabilitation >1yr, extending into other season cycles).	• Continuous • Permanent. • Beyond closure or decommissioning. • More than 15 years (or for rehabilitation >2yr, extending into multiple season cycles).
Status (-ve (High), neutral (Medium), +ve (Low))	• Beneficial effects • Net gain of resources	• Neutral • Indifferent • No net loss or gain	• Adverse effects • Costs • Net loss of resources
Probability (Definite (High), Probable (Medium), Improbable (Low))	• The impact will not occur, or it is highly unlikely that the impact will occur. • Limited useful information on and understanding of the environmental factors potentially influencing this impact (uncertainty) or a high degree of certainty that it will not occur. • Low probability or negligible - less than 1:20 chance of occurrence *(P<0.05)* of an impact occurring.	• There is a chance/risk of the impact occurring. • Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. • Moderate probability (5-95%) of a particular fact or the likelihood of an impact occurring.	• Impact will occur regardless of prevention measures. Substantial supportive data exist to verify the assessment. • Wealth of information on and sound understanding of the environmental factors potentially influencing the impact. • Definite or high probability (>95%) of a particular fact or the likelihood of an impact occurring.

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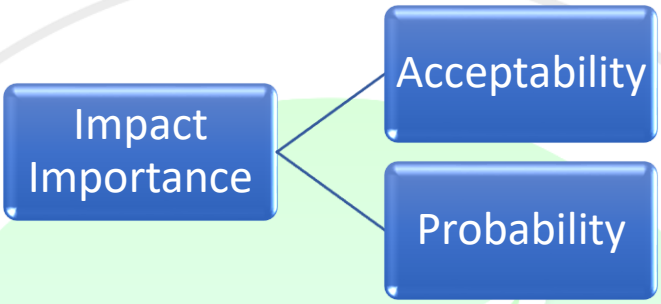
ii. Impact Importance (Significance)

Impact Importance is a composite score that is made up of the following two criteria: (1) Level of acceptability/consequence, and (2) Probability, likelihood of occurrence or degree of certainty.



The possible composite scores for Impact Importance are:

IMPACT IMPORTANCE		Probability		
		High	Medium	Low
Level of Acceptability	High	±1	±1	±0
	Medium	±1	±1	±0
	Low	±0	±0	±0

Assumption: If the Level of Acceptability and/or Probability is low, then Impact Importance is non-significant.

Significant	±1	Non-significant	±0

Table 14. Probability Criterion used in evaluating Impact Importance.

Ranks	Description
High (H) Definite	• Wealth of information on and sound understanding of the level of acceptability. • High degree of certainty. Definite or high probability (>95%) of a particular fact or the likelihood of a level of acceptability.
Medium (M) Probable	• Reasonable amount of useful information on and relatively sound understanding of the level of acceptability. • Moderate degree of certainty or probability (5-95%) of a particular fact or the likelihood of a level of acceptability.
Low (L) Improbable	• Limited useful information on and understanding of the level of acceptability. • Low degree of certainty or probability or negligible - less than 1:20 chance *(P<0.05)* for a level of acceptability.

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Table 15. Level of Acceptability Criterion used in evaluating Impact Importance.

Ranks	Description Source of information: Quantitative thresholds (legal requirements, scientific standards, international standards), qualitative thresholds (social acceptability expressed during PPP), Need & Desirability, Specialist Assessments

High (Unacceptable)	Consequence of impact or risk:
	• Need & Desirability results relating to this impact or risk, and within the context of a specific aspect of the environment, indicate that it is **unnecessary and/or undesirable**.
	• Environmental quality standards (e.g., GA for S21(f) with wastewater discharge limit values), thresholds (e.g., in listing notices) and targets (e.g., for biodiversity, species and ecological processes that CBAs are required to meet) **will be exceeded**.
	• Normative thresholds of impacts or resource use that are clearly established by social norms, usually at the local or regional level and often tied to social or economic concerns.
	• Non-compliance
	ENVIRONMENT
	• Extinction of biological species, loss of genetic diversity, rare or endangered species, critical (CR, EN) habitat.
	• Critically Endangered Species
	  ○ lead to a long-term decrease in the size of a population,
	  ○ reduce the area of occupancy of the species,
	  ○ fragment an existing population into two or more populations,
	  ○ adversely affect habitat critical to the survival of a species, or
	  ○ disrupt the breeding cycle of a population.
	• Critically Endangered Ecological Communities
	  ○ lead to a long-term adverse effect on an ecological community,
	  ○ reduce the extent of a community,
	  ○ fragment an occurrence of the community, or
	  ○ adversely affect habitat critical to the survival of an ecological community.
	• Listed Migratory Species
	  ○ substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species,
	  ○ result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species, or
	  ○ seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population.
	• Disruption of food webs.
	• Discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (nitrogen, phosphorous), radiation or thermal energy (e.g., cooling wastewater).

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	SOCIO-ECONOMIC • Appropriate and justifiable social and economic outcomes, including meeting basic needs and equity, **cannot be achieved, and will be exacerbated,** e.g., increase in unemployment or shrinkage in the economy. • Social **outrage and/or widespread condemnation** expressed during PPP. • Negative effects on human health, well-being or quality of life, e.g., reduction of the quality or quantity of recreational opportunities or amenities or detrimental change in the current use of lands and resources for traditional purposes by aboriginal persons. • Negative effects on cultural, heritage (incl. architectural), archaeological, or palaeontological resources. Required action: • Abandon project in part or in its entirety. • Redesign project to remove or avoid impact or risk.
Medium (Manageable)	Consequence of impact or risk: • Need & Desirability results relating to this impact or risk, and within the context of a specific aspect of the environment, indicate that it is **unnecessary or undesirable, but is manageable to the extent that it is neutral**. • Conflict with policies or land-use plans. • Environmental quality standards (e.g., GA for S21(f) with wastewater limit values), thresholds (e.g., in listing notices) and targets (e.g., biodiversity, species and ecological processes that CBAs are required to meet) **may be exceeded**. • Controversial thresholds of impacts or resource use that are highly controversial, or which are sources of conflict between various individuals, groups or organizations. ENVIRONMENT • **Threat** of extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat. • **Threat** of disruption of food webs. • Some loss of threatened (VU) habitat. • Loss of populations of or damage to commercial biological species. • Spread of biological disease, pests, feral animals or weeds can be avoided with mitigation. • **Threat** of discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (nitrogen, phosphorous), radiation or thermal energy (e.g., cooling wastewater). SOCIO-ECONOMIC • Appropriate and justifiable social and economic outcomes, including meeting basic needs and equity, **may be achieved**. • **Legitimate** concerns expressed by individuals or groups during the PPP **are manageable to the satisfaction of those concerned**. • Increases level of risk on human health, well-being or quality of life, e.g., potential reduction of the quality or quantity of recreational opportunities or amenities, or for detrimental change in the current use of lands and resources for traditional purposes by aboriginal persons. • **Threat** of negative effects on cultural, heritage (incl. architectural), archaeological, or palaeontological resources.

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	Required action: • Implement regulatory and/or management controls (with the project proponent's commitments). • Adequate compensation must be given to affected communities.
Low (Acceptable)	Consequence of impact or risk: • Need & Desirability results relating to this impact or risk, and within the context of a specific aspect of the environment, indicate that it is **needed and desirable, or neutral.** • Environmental quality standards (e.g., GA for S21(f) with wastewater discharge limit values), thresholds (e.g., in listing notices) and targets (e.g., biodiversity, species and ecological processes that CBAs are required to meet) **will not be exceeded**. • Preference thresholds of impacts or resource use that are preferences for individuals, groups, or organizations only, as distinct from society at large. • Compliance ENVIRONMENT • **No** extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat. • **No** disruption of food webs. • Some loss of populations and habitats of non-threatened species. • Modification of landscape without downgrading special aesthetic values. • Emissions demonstrably less than the carrying capacity of the receiving environment. • **Zero** discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (nitrogen, phosphorous), radiation or thermal energy (e.g., cooling wastewater). SCIO-ECONOMIC • Appropriate and justifiable social and economic outcomes, including meeting basic needs and equity, **will be achieved or at least remain unaffected**. • Project is **welcomed by I&APs, or they are indifferent**. • Zero risk or positive effects on human health, well-being, or quality of life, e.g., improvement of the quality or increase in the quantity of recreational opportunities or amenities. • Zero or positive effects on cultural, heritage (incl. architectural), archaeological, or palaeontological resources. • Positive, beneficial, or neutral, that is no risk of harm to the biophysical, economical, or social (incl. cultural heritage and public health) environments. Required action: • Enhance beneficial impacts or risks.

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(2) Phase 2-Assessment with mitigation

Once an impact has been identified, predicted, and evaluated to determine significance, the EIA Regulations, 2014 as amended, further require one to determine the degree to which these impacts (1) can be reversed, (2) may cause irreplaceable loss of resources, and (3) can be avoided, managed, or mitigated.

The fact these requirements are written as a separate provision in the EIA Regulations implies that they are not considered as part of the evaluation of significance but are rather to be considered afterwards.

Furthermore, the fact that the EIA Regulations require "the degree" to be determined also implies that rankings must be assigned to each of these considerations.

Reversibility, irreplaceability and mitigatory potential, when considered together with the outcome of the outcome of the Phase 1 assessment, will decide on whether the activity responsible for an impact should be refused or can be entertained further by re-assessing the impact with mitigation to confirm whether the activity may proceed.

So, during Phase 2 either or both Significance ranks (Impact Magnitude and/or Impact Importance) are considered together with the following three criteria; Reversibility (**Table 16**), Irreplaceable Loss of Resources (**Table 17**), and Mitigatory Potential (**Table 18**), to determine whether (1) a phase 1-assessment should be repeated with mitigation, or (2) the proposed activity needs to be refused or redesigned.

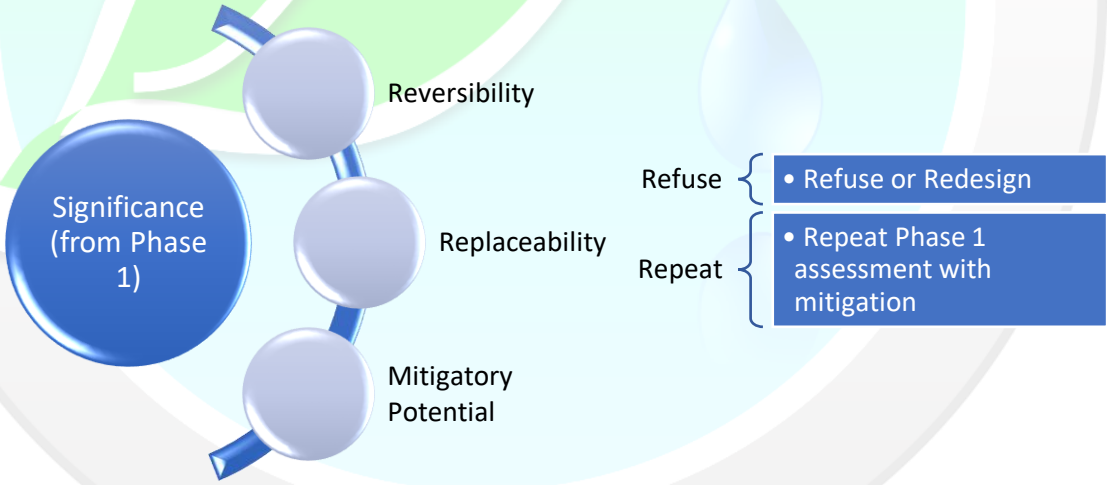

Table 16. Reversibility Criterion.

Ranks	Description
No to low degree	• If functional thresholds established for resource use are exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably. • Impacts are irreversible and/or the costs of human intervention are unaffordable.
Moderate degree	• Impacts are reversible with moderate to high (but affordable) human intervention.

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High degree	• Impacts are naturally reversible, e.g., do not require any or only little human intervention.

Table 17. Irreplaceability Criterion.

Ranks	Description
Low degree to irreplaceable	• If functional thresholds established for resource use are exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably.
Moderately replaceable	• Large scale loss of productive capacity of renewable resources. • Moderate scale loss of productive capacity of non-renewable resources.
High degree of replaceability	• Low to moderate loss of productive capacity of renewable resources. • Low scale loss of productive capacity of non-renewable resources.

Table 18. Mitigatory Potential (for negative and positive impacts or risks) Criterion.

Ranks	Description
Low	• Little or no mechanism for mitigation and/or achieving the objectives. • No possible mitigation that could offset the impact or mitigation is difficult, expensive, time-consuming or some combination of these.
Moderate	• Moderate potential (few mechanisms) to mitigate negative impacts, but there remains a risk of the objectives not being met and/or the implementation of mitigation measures may still not prevent some negative effects. • Mitigation is both feasible and possible.
High	• High potential to mitigate negative impacts to the level of insignificant effects and achieve objectives. • Mitigation is either easily achieved or little will be required, or both.

Important Note: provide mitigation objectives that would result in a measurable reduction in the impact or risk (using expertise and/or experience). Mitigations must be realistic, that is reasonable and feasible. Quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation action should be provided where appropriate.

Residual Risk

Finally, the level of residual risk after mitigation is determined.

If adequate mitigations are applied, then the residual risk should be at a level of acceptable risk, meaning either the consequences of the impact will be below the quantitative or qualitative thresholds prescribed by legal, scientific, or social acceptability or the magnitude will be low.

If the mitigated risk is not at a level of acceptable risk, then the mitigations are lacking, or if all reasonable mitigations have been exhausted, then the activity responsible for the impact must be refused.

Residual risk also includes the consideration of other factors that could prevent the desired outcomes of the proposed management measures and mitigations.

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Site Selection Matrix

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(ix) the outcome of the site selection matrix;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Table 19. Site Selection Matrix of preferred alternative site before (A1 before) and after (A1 after) mitigation relative to the no-go alternative. (No-Go).

Aspect	Legal system	Biological				Physical			Geographic		Socio-economic								Heritage & Culture
		Terrestrial & Avian fauna	Terrestrial flora	Aquatic fauna	Aquatic flora	Soil and Rock	Ground & Surface water	Atmosphere	Terrestrial Ecosystem	Aquatic Ecosystem	Economical	Social	Property	Land Use	Health & safety	Security	Public services	Visual aesthetics	
A1 before																			
A1 after																			
No-Go																			

Non-significant negative or positive impact

Significant negative impact

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Outcome of the Site Selection Matrix

Rolling scheduled and controlled shutdowns (known as load shedding) as well as unplanned and unpredictable outages or blackouts are crippling economic growth and negatively impacting on the well-being of South African citizens. For businesses, unreliable electricity results in increased running costs and reduced productivity and profitability. It's estimated that the loss to businesses and industries that battle with scheduled power cuts, stands at about R1-billion per stage, per day (https://www.thesouthafrican.com/news/how-long-load-shedding-monday-9-december-when-eskom-floods/).

The proposed development of a 400 MW Solar PV Facility, particularly when considered together with Phases 1 and 2 (1 GW in total), will make a significant contribution to our country's power deficit when supply falls behind demand, meeting basic needs and equity that the no-go option cannot achieve (**Table 19**).

However, if the development is left uncontrolled, these justifiable socio-economic outcomes are overshadowed by other local but potentially significant negative environmental impacts on different aspects of the environment (**Table 19**).

An assessment of the preferred alternative site relative to the no-go alternative (**Appendix D**) has shown that it is not only possible with mitigations to reduce the significance of environmental impacts to within acceptable limits (**Table 19**), but in the case of the terrestrial ecosystem, even provide a powerful climate resilient land-use option that the no-go alternative (extensive livestock grazing only) cannot (**Table 19**).

According to the District Municipality's Climate Change Response Plan there are increased risks to *inter alia* Biodiversity and the environment, including increased impacts due to land-use change associated with continuing development of the renewable energy corridor. Consequently, the proposed mitigation is to adopt a symbiotic 'Agrivoltaic' system that combines agriculture, specifically good ecological management (grazing) practices, with green energy generation, simultaneously supporting the agricultural and energy industries. Diversification by changing the current land-use (Agriculture) to an 'Agrivoltaic' system is potentially a powerful climate resilient land-use, involving both climate change (CC) mitigation and adaption measures, compared with the increased pressures of extensive grazing on a terrestrial ecosystem under more frequent and intense drought periods.

The success of the proposed 'Agrivoltaic' system in building climate change resilience is further facilitated by proposed mitigations to halt and reverse existing degradation from extensive livestock production or other drivers and maintain ecosystem integrity by undertaking detailed soil mapping and veld condition assessments to determine the grazing capacity of the project area so that the landowner doesn't exceed recommended stocking densities thereby ensuring adequate vegetation cover necessary for the maintenance of ecosystem services.

The landowner or farmer's livelihood is also guaranteed as the additional income stream from leasing the land to Soventix SA (Pty) Ltd will help offset productivity and sales losses from reduced stocking densities when drought periods dictate lower carrying capacities (CC adaption), whilst ensuring good ecological management and maintenance of ecosystem integrity (CC mitigation).

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Concluding Statement

2(1) A scoping report… must include –

(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including –

(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

The preferred alternative site is located on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C. The approximate centre of the development footprint is S30° 49' 58.997" and E24° 21' 40.584". Solar PV facilities have a specific suite of requirements (**Table 8**), limiting site alternatives. The location of this application is further constrained by the fact that it is the third phase of a larger (I GW) development, and therefore needs to be within close proximity to the authorised (Phase 1) development, and specifically the Main Transmission Substation where the electricity will tie into the national grid.

Of all the potential properties owned by Mr Willem Retief, only the two contiguous farms, being the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, are available for the proposed development of Phase 3 because they contain the only consolidated surface area (outside "No-Go" zones and CBAs) that is big enough to support a 600 ha solar PV facility. However, the available surface area for development is still restrictive (876 ha), particularly considering the extent of the ecological, massing, and visual sensitivity buffers proposed by the specialists during their preliminary investigations.

As such, the preferred layout will not be determined by an assessment of potential alternative configurations, but will instead, be the product of a holistic and multi-disciplinary investigation, involving various online spatial planning tools and the site-specific findings and recommendations of all the specialist assessments. The aim of the environmental impact assessment will be to identify and eliminate sensitive environmental attributes from the preferred site and location, and in so doing arrive at the preferred development footprint (or layout).

An impact and risk assessment of the preferred alternative relative to the no-go option (extensive livestock grazing only) was undertaken (**Appendix D**). It is the EAP's opinion (for the reasons given below) that the proposed development on the preferred alternative site is the best practicable environmental option and should be subjected to an environmental impact assessment in order to comprehensively determine the feasibility of the project and mitigate impacts relating to its development (and operation).

Impact Statement

A Summary of the key findings

The project area is zoned as Agriculture Zone 1 (not open space or conservation). Agriculture (mostly 'Karoo' mutton, sheep, and wool, with some hunting of small game) forms the backbone of the economy of the Emthanjeni Local Municipality and accounts for the largest labour/employment contributor to date.

The project area is in Ward 6 of the Emthanjeni Local Municipality that is located in the Pixley Ka Seme District Municipality in the Northern Cape province. The towns in the area are small and the proposed site is located between the towns of Hanover and De Aar. About 74% of the people in Ward 6 live in urban areas while the remaining 26% (one quarter) live on farms. There are no areas under traditional

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leadership in the district and the site is surrounded by commercial farms. Education levels are low (About two fifths (17,8%) of the people in Ward 6 aged 20 years or older have no schooling or only some primary education). In Ward 6, 45,3% of people aged between 15 – 65 years are employed, with about half of those people in the formal sector. Ward 6 has the lowest proportion of people (6,7%) with no annual household income. **There are very few employment opportunities**.

The proposed development area does not fall within any of the eleven (11) identified Renewable Energy Development Zones (GN No. 114, GG No. 41445 of 16 February 2018, as well as GN No. 786 of 17 July 2020), but it is located within a Strategic Transmission Corridor (GN No. 113 in GG No. 41445 of 16 February 2018, as well GN No. 383, GG No. 44504 of 29 April 2021), specifically within the "Central Corridor." Despite being in the Central Corridor, the applicant cannot follow the basic assessment procedure contemplated in Regulation 19 and 20 of the Environmental Impact Assessment Regulations, 2014 in order to obtain environmental authorisation because the scope of this application excludes LA 9 of LN2.

The project area falls within an Astronomy Advantage Area (AAA) under the Astronomy Geographic Advantage (AGA) Act, 2007 (Act No. 21 of 2007), but the proposed solar PV facility represents a low risk of interference to the SKA radio telescope (including MeerKAT) with a compliance surplus of 57.02 dBm/Hz (Response Letter from Mr Selaelo Matlhane, Spectrum & Telecommunication Manager of the South African Radio Astronomy Observatory (SARAO) and dated 16 March 2022).

The project area is not within (a) a protected area or within 5 km of a protected area, (b) the core area or within 5 km of the core area of a Biosphere Reserve, (c) a National Protected Area Expansion Strategy Focus Area according to the National Protected Area Expansion Strategy (2016), and (d) a sensitive area in terms of an EMF (as there is no EMF).

The project area is not within an Air Quality Priority Area.

The geology of the project area is underlain by flat-lying sedimentary rocks of the Karoo Supergroup, which have been intruded by innumerable sills and dykes of dolerite.

The project area is not within a site identified in terms of an international convention, such as a RAMSAR site, but the area does contain **National Freshwater Ecosystem Priority Areas**, specifically "Wetlands and Estuaries" (Screening Report). The non-perennial drainage streams associated with the site are classified as riverine wetland system. It is also located within a **Strategic Water Source Area**. The ephemeral drainage line running through the project area is an unnamed tributary to the D62D – 05610 tributary with its confluence further downstream of the project area. The project area contains 3 Hydrological Response Units (HRU). Ninety-six percent (96%) of the project area falls within HRU2, which has an average slope of 0,56%. Consequently, the topography of the study area is generally flat with elevations on the site typically ranging from 1 335 to 1 370 m above mean sea level.

Micro sub-catchment sheet flow towards lower-lying depressions within the non-perennial river flood plains is likely to dominate flood propagation, and isolated flooded areas (or ponded flood occurrence zones) are predicted to occur. **The flood line determination suggests a low flooding risk as no clearly defined drainage lines occur. As such, no clearly defined exclusion zones or protection buffer areas could be mapped or recommended.**

The project area falls within a spring to summer rainfall area (October to April), ranging from 112,4 to 738,9 mm/yr but averaging 320 mm/yr. The Mean Annual Evaporation (2 000 – 2 150 mm/yr) exceeds the Mean Annual Precipitation (MAP) by about 85%, so non-perennial streams and rivers will only have water when there are flooding events. Run-off during the peak months (January to April), ranges from 0,3 to 1,1 mm/yr over the surface area of quaternary catchment D62D. The annual run-off from natural (unmodified) catchments in D62D is approximately 0,9% of the MAP.

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Accounting for changes in soil type, slope angle and rainfall intensity, ground cover beneath solar arrays was found to have the most significant impact on run-off rates. **So, if vegetation cover beneath the solar arrays is maintained, no significant increase in surface water run-off is anticipated compared to greenfield run-off rates.**

De Aar is dependent on groundwater for agriculture and drinking water. The project area overlies a moderate to high yielding aquifer (median yields of 0,5 to 2 L/sec). However, the landowner, Willem Retief has indicated that each windmill pump (there are two pumps) yields approximately 0,33 L/s, which falls at the bottom of the aforesaid range. The landowner also noticed that the water table dropped by at least 3 ms over the last few years during the drought. Furthermore, water scarcity in the arid Pixley Ka Seme District Municipality is expected to be exacerbated by climate change, specifically drought. Under a low climate change mitigation scenario, model simulations indicated an average temperature increase by 2.3 °C, an increase of 16.1 in the total number of heat waves experienced and a decrease in rainfall to 17 mm - 74.3 mm annually. The potential significance of the impact of the proposed development on groundwater is further stressed by the project's location in a Strategic Water Source Area. **It is for these reasons that the applicant commissioned a geohydrological study; to determine if there is enough groundwater to support demand during construction and operation without deteriorating the ecological reserve or impacting other water users, both within the short and long term, given the anticipated increase in frequency of extreme events, including drought, resulting from climate change.**

The De Aar area falls within the Nama Karoo biome. The project area is not within a critically endangered or endangered ecosystem in terms of SANBI's latest NBA (2018). The National vegetation type is Northern Upper Karoo and is considered Least Threatened in the National List of Threatened Ecosystems (NBA, 2018). However, its Ecosystem Protection Level is categorised as Poorly Protected Ecosystem; less than 2,9% of the area is statutorily conserved (protected), compared with the national conservation target of 21%.

The project area is located within an Ecological Support Area (ESA) because the planning units that occur within the project area (Unit ID: 5605, 5701, 5702, 5798 and 5895) have the following biodiversity features: Eastern upper Karoo veg type; Northern Cape Upper Karoo veg type; IBA area; NFEPA wetlands and rivers; and FEPA catchment.

The project area is within an Important Bird Area (IBA) called Platberg-Karoo Conservancy (unprotected). A relatively high diversity of 128 bird species for the area has been recorded within the 4 SABAP pentads in which the study area is situated. During the March 2022 site visit, a total of 69 species were recorded within the 4 pentads. A total of 24 priority species (e.g., rare, SA endemic) are expected to occur within and surrounding the study area. Fourteen (14) of these species have medium to high occurring probability (POC) on the site. Thirteen (13) of the 24 priority species are listed as threatened and near threatened. Seven (7) of these regionally/globally threatened and near-threatened species were observed during the site visit, including Ludwig's Bustard, Blue Crane, Martial Eagle, Verreaux's Eagle, Lanner Falcon, Karoo Korhaan, and Secretary Bird.

All the IBA trigger species are predicted to be moderately susceptible to the various impacts of solar-energy facilities, whereas numerous existing and new power lines are considered significant threats to trigger species. There is currently no completely effective mitigation method to prevent collisions. **Ludwig's Bustard was listed as globally Endangered on the IUCN Red List in 2010 as a result of potentially unsustainable collision mortality, but there is no evidence for a population decrease over the past 20 years despite extremely high annual power line mortality rates (41% of the Ludwig's Bustard population).**

Landscape features and receptors that add to the medium to high levels of local Scenic Quality includes (a) proximity to ridgeline features and areas of prominence (b) neighbours who are sensitive to

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landscape changes to the existing rural agricultural landscape character, particularly by neighbouring landowners located to the north- and south-east of the development site, and (c) massing effects created by large scale coverage or expanses of solar PV panels in a rural agricultural landscape setting exacerbated by the location of the adjacent Phase 2 development with medium to high levels of Scenic Quality. **However, proposed mitigations, specifically 'visual sensitivity' and 'massing' buffers hold the potential to produce a less dominant landscape change** and maintain visual quality by visually buffering adjacent land uses/farms along north- and south-eastern property boundary (as these owners have indicated concern regarding the semi-industrial type of development in a deep rural setting).

The project area does not fall within a World Heritage Site or within 10 km of a World Heritage Site according to the PAR. Previous archaeological and heritage assessments for Phase 1 recorded a fairly large number of cultural heritage (archaeological & historical) resources of varying extent and significance in the area. These include scatters of open-air surface Stone Age sites, rock engravings, later agro-pastoralist stone-walled sites, as well as historical Anglo-Boer War (18990-1902) sites. **These findings are clear evidence of the intrinsic heritage value of the area and the fact that further assessments would be required for this application.**

The project area is underlain at depth by potentially fossiliferous continental bedrocks of the Lower Beaufort Group (Karoo Supergroup) of Middle Permian age that have yielded sparse but scientifically important vertebrate remains in the Hanover area as well as commoner petrified wood. Also present are non-fossiliferous dolerite intrusions and Late Caenozoic superficial sediments (e.g., alluvium, surface gravels) which might contain important fossil mammal and other remains as well as reworked fossil wood blocks. "The most likely outcome, based on comparable project areas in the Hanover - De Aar region of the Great Karoo, is that comparatively few scientifically useful fossil sites will be recorded, while No-Go palaeontological areas are very unlikely to be designated. **Most Karoo fossil sites are of limited extent and can be effectively mitigated in the pre-construction phase, so palaeontological constraints on the project footprint are not anticipated, although they cannot be completely excluded in advance**." *Dr. John Almond, NATURA VIVA cc Palaeontological Impact Assessments & Heritage Management, Natural History Education, Tourism, Research Budget Proposal dated 20 January 2022.*

Preferred Alternative Site

Southern Africa is witnessing an increased frequency and intensity in climate change-associated extreme weather events, causing water, food, and energy insecurity. Reduced agricultural production, lack of access to clean water, sanitation, and clean, sustainable energy are the major areas of concern (Mpandeli S., *et. al*. 2018).

What is clear is that climate change impacts are cross-sectoral and multidimensional, and therefore require cross-sectoral mitigation and adaptation approaches. In this regard, a well-coordinated and integrated WEF nexus approach offers opportunities to build resilient systems, harmonise interventions, and mitigate trade-offs and hence improve sustainability (Mpandeli S., *et. al*. 2018).

The proposed development involving an 'Agrivoltaic' system can, if supported by sound ecological and water use management strategies (to be incorporated into the EMP), provide the kind of cross-sectoral climate change adaptation opportunity needed to respond to the challenge of climate change on the water-energy-food (WEF) nexus in southern Africa.

Mpandeli S, Naidoo D, Mabhaudhi T, Nhemachena C, Nhamo L, Liphadzi S, Hlahla S, Modi AT. **Climate Change Adaptation through the Water-Energy-Food Nexus in Southern Africa**. Int J

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Environ Res Public Health. 2018 Oct 19;15(10):2306. doi: 10.3390/ijerph15102306. PMID: 30347771; PMCID: PMC6210720.

The proposed adoption of a symbiotic 'Agrivoltaic' system that combines agriculture, specifically good ecological management (grazing) practices, with green energy generation, simultaneously supports the agricultural and energy industries. Furthermore, diversification by changing the current land-use from Agriculture to an 'Agrivoltaic' system is potentially a powerful climate resilient tool, involving both climate change mitigation and adaption measures, compared with the increased pressures of extensive grazing on a terrestrial ecosystem under more frequent and intense drought periods.

The success of the proposed 'Agrivoltaic' system in building climate change resilience is further facilitated by proposed mitigations to halt and reverse existing degradation from extensive livestock production or other drivers and maintain ecosystem integrity by undertaking detailed soil mapping and veld condition assessments (during the environmental impact assessment) to determine the grazing capacity of the project area so that the landowner doesn't exceed recommended stocking densities thereby ensuring adequate vegetation cover necessary for the maintenance of ecosystem services.

The proposed development of a 400 MW Solar PV Facility, particularly when considered together with Phases 1 and 2 (1 GW in total), will make a significant contribution to our country's power deficit when supply falls behind demand, meeting basic needs and equity that the no-go option cannot achieve (**Table 19**). At a local level, the landowner or farmer's livelihood is also protected as the additional income stream from leasing the land to Soventix SA (Pty) Ltd will help offset productivity and sales losses from reduced stocking densities when drought periods dictate lower carrying capacities, whilst ensuring good ecological management and maintenance of ecosystem integrity.

However, if the development is left uncontrolled, these justifiable socio-economic outcomes are overshadowed by other local but potentially significant negative environmental impacts on different aspects of the environment (**Table 19**).

The three biggest concerns identified during the scoping phase include (1) sustainable yields of groundwater in the underground aquifer, particularly given the threat of water scarcity identified in modelled climate change predictions, (2) the protection and restoration of NFEPA wetlands and a Strategic Water Source Area, and (3) the impact on high levels of local scenic quality, particularly, the unique agricultural 'Karoo' landscape character as experienced by neighbouring landowners. With the exception of sustainable yields from the underground aquifer (as results of this study are still pending), potentially significant impacts to the aquatic ecosystem and scenic quality can be mitigated through appropriate ecological, massing and visual sensitivity buffers to reduce the significance of environmental impacts to within acceptable limits (**Table 19**) or at a cost that is acceptable for the predicted justifiable socio-economic outcomes and building resilience to climate change.

No-Go-option

The no-go option would remain agriculture, specifically extensive livestock grazing. Agriculture (mostly 'Karoo' mutton, sheep and wool, with some hunting of small game) forms the backbone of the economy of the Emthanjeni Local Municipality and accounts for the largest labour/employment contributor to date. However, according to the District Municipality's Climate Change Response Plan, it is at risk to drought, less grazing and increased livestock mortality, affecting commercial exports.

If stocking densities aren't reduced to counter the reduced carrying capacity during the predicted increase in drought periods and intensity, then ecosystem degradation, particularly of the ESA, NFEPA wetlands and Strategic Water Source Area, is inevitable.

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Extensive Livestock grazing on its own, unless diligently managed, cannot offer the same protection to the land and landowner as that afforded by diversification, in this case the cross-sectoral land-use option of an 'Agrivoltaic' system.

Other opportunity costs for maintaining the status quo include depriving citizens of such socio-economic outcomes as employment opportunities during development (and operation), and much needed green electricity.

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SECTION H: A PLAN OF STUDY

Description of Alternatives

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended.

Please refer to SECTION G above.

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Description of Aspects to be Assessed

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(ii) a description of the aspects to be assessed as part of the environmental impact assessment process;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

The receiving environment referred to as "environmental attributes" or "aspects" in Appendix 2 of the EIA Regulations, 2014 as amended, and which are to be assessed as part of the environmental impact assessment process (**Appendix D**) is described in **Table 20**.

Table 20. Aspects to be assessed as part of the environmental impact assessment process.

Aspect	Legal system	Biological				Physical			Geographic		Socio-economic								Heritage & Culture
		Terrestrial & Avian fauna	Terrestrial flora	Aquatic fauna	Aquatic flora	Soil and Rock	Ground & Surface water	Atmosphere	Terrestrial Ecosystem	Aquatic Ecosystem	Economical	Social	Property	Land Use	Health & safety	Security	Public services	Visual aesthetics	

Legal system

The legal aspect that is to be assessed includes other authorisations, permits and/or licenses that may also be required for activities associated with the proposed development. The purpose is to ensure ongoing compliance and avoid project delays.

Biological (Terrestrial & Avian fauna, Terrestrial flora, Aquatic fauna and flora)

Consideration of the biological aspect focuses on whether there will be a change in the number of threatened and/or protected animals or plants resulting from either a loss (e.g., emigration, death) or gain (e.g., reproduction, immigration) in individuals.

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Physical (Soil and rock, and Ground and surface water)

Consideration of the physical aspect focuses on whether there will be a change in the quantity, e.g., through erosion, sedimentation, abstraction, etc. and/or quality of soil or water, e.g., through pollution. The effects of changes to surface water hydrology, e.g., storm water run-off, in-stream flow, etc., particularly on the bed and banks of a watercourse, are also considered under this aspect.

Physical (Atmosphere)

Consideration of this physical aspect focuses on whether there will be a change in the quality of air, e.g., through pollution. Somatosensory (perception of touch, as well as temperature), auditory and olfactory signals that impact people, such as noise, smell and warming, are also assessed under this aspect.

Geographic (Terrestrial and Aquatic ecosystems)

Consideration of these geographical aspects focuses on whether there will be a change in the quantity (area) of threatened and/or protected ecosystems, whether there will be a transformation of habitat to an alternate state following a change in species composition (fauna and/or flora) and structure (relative heights, and whether there will be fragmentation when a habitat is broken up and no longer contiguous, impacting ecological connectivity and the river continuum concept.

Socio-economic

Consideration of the socio-economic aspect takes into account economical (or financial) implications, as well as other attributes such as social (general well-being), property (land, infrastructure and other assets), land use, health and safety, security, public services, and visual aesthetics.

Heritage and Culture

Consideration of heritage and culture focuses on whether there will be a chance of damage to or loss of cultural heritage resources as a result of the proposed development.

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Description of Aspects to be Assessed

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(iii) aspects to be assessed by specialists;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Fifteen (15) specialist assessments shall be undertaken to assess various environmental aspects as well as issues and concerns (uncertainty) raised by I&APs and the authorities to date (**Table 21**).

Table 21. Aspects to be assessed by specialists.

Aspect		Specialist Assessment
Legal System		
Biological	Terrestrial and Avian fauna	• Terrestrial Animal Species Specialist Assessment • Avifauna Specialist Assessment • Bat Impact Assessment
	Terrestrial flora	• Terrestrial Plant Species Specialist Assessment • Agricultural Agro-Ecosystem Specialist Assessment (including veld condition assessments)
	Aquatic fauna	• Aquatic Biodiversity Specialist Assessment
	Aquatic flora	• Aquatic Biodiversity Specialist Assessment
Physical	Soil and Rock	• Agricultural Agro-Ecosystem Specialist Assessment (including soil mapping) • Geotechnical Assessment
	Surface and Groundwater	• Hydrology Assessment • Geohydrological Assessment
	Atmosphere	
Geographic	Terrestrial ecosystem	• Terrestrial Biodiversity Specialist Assessment
	Aquatic ecosystem	• Aquatic Biodiversity Specialist Assessment
Socio-economic		• Socio-Economic Impact Assessment • Visual Impact Assessment • Traffic Impact Assessment
Cultural and Heritage		• Archaeological & Cultural Heritage Specialist Assessment • Paleontological Specialist Assessment

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Description of Aspects to be Assessed

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(iv) a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

The proposed methods of assessing the environmental aspects to be assessed by specialists (**Table 21**) are described in the specialists' plans of study (**Appendix E**) and summarised below.

Biological and Geographic Aspects

Terrestrial Biodiversity, Animal Species and Plant Species Specialist Assessment

A site visit and a desktop review of the available ecological information for the area was conducted in order to identify and characterize the ecological features of the site. This information was used to derive an ecological sensitivity map that presents the ecological constraints and opportunities for development at the site, which can be used for development planning.

Objectives

a) Determine how this development (and its separate elements) will impact on the terrestrial ecological integrity of the area, particularly relating to habitat loss/fragmentation, alteration of habitat quality, species assemblage changes, microclimate disturbance, breeding as well as management of wild game on adjacent properties and reduced connectivity between populations in some species.

b) Include a corridor analysis for the migration of fauna across the landscape, taking the cumulative impact of all three phases into account as well as neighboring properties.

c) Determine, delineate (map), and describe the different vegetation communities and rocky outcrops.

d) Identify actual and potential species of conservation concern/importance and the position of all indigenous trees taller than 1.8m and all vegetation of conservation concern.

e) Demarcate appropriate ecological buffers around sensitive communities or receptors.

f) Compile a search and rescue plan for relevant species to be adopted prior to construction.

g) Identify and quantify the perceived impacts and propose mitigations to be included in the EMPr. The potential impacts and recommended mitigations must be identified for the planning and design, pre-construction, construction, and post-construction (e.g., monitoring rehabilitation of the construction site) only.

h) The impacts must be assessed and evaluated according to the EIA Regulations, 2014 as amended or the Impact Assessment Criteria and Matrix

i) Undertake a cumulative impact assessment of all three phases. Then, in addition to the development site, also take into consideration other similar facilities within a 30km radius of the proposed development site.

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Methodology

Data Sourcing and Review for Vegetation:

a) Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011).

b) Critical Biodiversity Areas were obtained from the newly developed Northern Cape Conservation Plan for the study area.

c) Information on plant and animal species recorded for the Quarter Degree Square (QDS) 3024 was extracted from the SABIF/SIBIS database hosted by SANBI.

d) The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2014).

e) Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA.

f) Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Data Sourcing and Review for Fauna:

a) Lists of mammals, reptiles, amphibians and avifauna which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases.

b) The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

c) The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

Site Visits

a) The site was visited over 4 days from 1-4 March 2017. Different biodiversity features, habitat, and landscape units present at the site within each PV target area were identified and mapped in the field.

b) Specific features visible on the satellite imagery of the site were also marked for field inspection and were verified and assessed during the site visit.

c) Walk-through-surveys were conducted within representative areas across the different habitat units identified and all plant and animal species observed were recorded.

d) Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species such as around wetlands and in the rocky hills.

e) The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

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f) Small mammal trapping was conducted for 3 nights using 60 sherman traps baited with a peanut butter and oats mixture. The traps were distributed within the rocky hills and the open plains of the site and aimed at maximising the number of habitats sampled. Traps were set every evening before sundown and checked each morning before 8am.

Sensitivity Mapping & Assessment

a) An ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery of the site as well as personal knowledge of the site.

b) This includes delineating different habitat units identified on the satellite imagery and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern.

Avifauna Specialist Assessment

The study area is situated within the Nama Karoo Biome and the Northern Upper Karoo vegetation type. The area supports several large terrestrial bird species such as cranes, bustards and korhaans, including large raptor species. Therefore, considering the study area important in terms of conservation of these type of bird species.

A total of twenty-five (24) priority species has the possibility of occurring within and around the study area, including Blue Crane, Jackal Buzzard, Martial Eagle, Booted Eagle, Verreaux's Eagle, and Ludwig's Bustard. Special attention will be place on these species, especially on the Verreaux's Eagle nest site that has been identified during the site visit.

The principal aim of the avifaunal assessment will be to determine how this development (and its separate elements) will impact on the terrestrial ecological integrity of the area (as it pertains to avifauna) and if necessary, demarcate appropriate ecological buffers around sensitive communities or receptors.

Objectives

a) Provide quantitative information on the abundance, distribution, and risk to key avifaunal species or groups of species and serve to inform and improve mitigation measures.

b) Determine how this development (and its separate elements) will impact on avifauna, particularly relating to habitat loss/fragmentation, alteration of habitat quality, species assemblage changes, microclimate disturbance and reduced connectivity between populations in some species.

c) Include a corridor analysis for the migration of avifauna across the landscape, taking the cumulative impact of all three phases into account.

d) Identify actual and potential species of conservation concern/importance (protected – NEMBA, endemic, threatened). GPS the position of all sensitive receptors (protected, endemic and/or red data species).

e) Demarcate appropriate ecological buffers around sensitive communities or receptors.

f) Compile a search and rescue plan for relevant species to be adopted prior to construction.

g) Identify and quantify the perceived impacts and propose mitigations to be included in the EMPr.

h) The impacts must be assessed and evaluated according to the EIA Regulations, 2014 as amended or the Impact Assessment Criteria and Matrix

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i) Undertake a cumulative impact assessment of all three phases. Then, in addition to the development site, also take into consideration other similar facilities within a 30km radius of the proposed development site.

Methodology

Spatial Data

a) Existing data layers were incorporated into a GIS to establish how the proposed layout and associated activities interact with important terrestrial entities.

Desktop and Literature Survey

a) A desktop survey is conducted to consider the best information available, in order to provide a better evaluation of all conditions present within the study area.

Preconstruction Bird Monitoring Survey Design

a) During the first site visit a site reconnaissance was conducted to identify site characteristic found within the study area such as habitats, bird species and site sensitivities such as sensitive bird species observed, sensitive habitats with there associated sensitive bird species and observation of nest of sensitive bird species.

b) The site visit was conducted in March 2022. During the site visit, sampling was done by means of walking and driving in and around the study area. Waterbodies in and outside of the study area were identified and proximity powerlines and pylons were scanned for any possible nests from sensitive bird species.

c) The avifaunal sensitivity was determined based on the number of priority species occurring, or potentially present, within or around the study area, the regional or globally threat status of these species, avifaunal habitat found in the area, population of priority species, bird movement corridor and Important Bird and Biodiversity Area.

d) The duration, in terms of data collection, for this study will be 6 months (pre- and post-construction; minimum of 2-3 visits of 2-5 days each), including carcass searches. It is important to take note that this period may be extended should there be a high risk of impact on the priority bird species observed in or around the study area, such as active nests. It is important that this period should be timed to include the peak season of avian abundance, which was already done during the site visit in March 2022.

e) The site visits that will be conducted during the three additional seasons, will form part of the data sampling methods used as per the Best Practice Guidelines.

f) Walking transects, driving transects and vantage points will be determined after the first site visit. Additional methods that will commence during the first site visit includes nesting sites and Coordinated Waterbird Counts, (CWAC).

    i. Vantage Points

    These sampling points will be located at strategic locations within the Soventix Solar Farm and set up to allow the visual coverage of the solar farm and its immediate surroundings. Each location will be surveyed for a minimum of 12 hours of observation per season divided through the early morning, midday and late afternoon times of day.

    ii. Walking Transects

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Transects will be positioned at varying distances away from the proposed solar farm. Linear transects will be determined during the first site visit and will be approximately 1 km each. Each linear transect will be conducted by one expert bird observer at a time, who records all bird contacts (both seen and heard) by walking slowly along the predetermined transect. Observations will be made on both the left and right side of the predetermined transect. Birds will only be recorded (seen or heard) within a fixed maximum width of 200 m on either side of the transect line. The same transects will be repeated in every season. Surveys will commence mostly after sunrise and will be performed throughout the day to account for temporal variation in activity.

iii. Driven Transects

Populations of large terrestrial birds will be estimated on each visit to the project area by means of road counts. Road counts of large terrestrial birds and raptors require that one or a few driven transects be executed comprising one or a number of set routes. The number, distance and locations of each driving transects will be determined during the first site visit in Autumn.

iv. Nesting sites

Any habitats within the broader impact zone of the proposed development, or an equivalent area around the site, deemed likely to support nest sites of key raptor and other species of conservation concern, including power lines, stands of large trees, marshes and drainage lines, will be search for, monitored and surveyed. All potential breeding sites, once identified fully, will be mapped, and checked during each survey to confirm occupancy, and all evidence of breeding and the outcomes of such activity, where possible, will be recorded.

v. Waterbodies

Prior to the initiation of the preconstruction monitoring campaign, the main water bodies (including wetlands) present within the study area were identified during the site visit in March 2022 and will be mapped on a Geographical Information System (GIS). All identified water bodies continue to be surveyed to determine their level of utilisation by water birds.

Water birds, including potential roosting sites, will be recorded by the observers during all the surveys.

vi. Incidental Observations

All other sightings of priority species will be recorded, along with additional relevant information such as habitat type, abundance, habit and weather data.

Bat Impact Assessment

The impacts of solar project developments on bats remains largely unknown. Collection of baseline data of bat activity in areas demarcated for solar projects are important for understanding the impacts of these developments on local and potentially regional biodiversity.

The layout of the solar footprint could fall into sensitive bat areas which should be avoided or mitigated. Limited data has indicated that bat activity over a solar development was lower than over the natural areas. The impacts of the development extends beyond the alteration of habitat and available resources that would affect bat activity, abundance and diversity (Korine et al. 2016) but during the operational phase, the impacts of artificial light pollution (flood lights for security reasons), associated with the solar project, could change behaviour and abundances of bat species within the bat community including alteration of commuting routes and preferred foraging habitat (Stone et al. 2015, Voigt et al. 2020).

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The potential of bats to collide with solar panels is largely speculative. Follow up monitoring after the development of the solar project is important to monitor the effects of the solar development i.e. follow up monitoring could provide evidence for or against the theory that bats may attempt to drink from the panels and or collide with them.

The following activities in relation to Phase 3 and infrastructure development of Phases 1 & 2 would trigger a bat scoping study (SABAA-South African Bat Assessment Association):

a. Any disturbance of destruction of natural rocky outcrops and or roost type structures, both natural and anthropogenic.

b. Disturbance within 500m of structures, above and below ground, that could be used as bats as roosting sites, natural and or anthropogenic.

c. Disturbance or destruction of rivers and wetlands, or within 200m of riparian areas.

Objectives

The following objectives will be met from the survey:

a. All species recorded in the area will be identified and their association with specific habitat types will be described.

b. The potential impact of the development on bat populations in the area will be investigated.

c. Bats of conservation importance will be identified if present but also the potential of their occurrence.

d. Areas of importance to bats will be identified, buffer zones indicated, and mitigation measures suggested to be put in place.

Methodology

Due to the wet marshy conditions of the veld and prevailing weather conditions, driven transects were not possible during the field work conducted from 01 – 06 April 2022. The following methodology was used:

a. Three bat detectors have been placed centrally in each core area of potential development. One SongMeter SM3 with a SMM-U1 ultrasonic microphone and two SM4Mini bat detectors (Wildlife Acoustics, Inc.) to passively monitor bat activity over the proposed development area.

b. Kaleidoscope Pro (Wildlife Acoustics, Inc.) will be used to convert the recorded sound files (.wav) into zero-crossing files (ZC).

c. Bat call analysis will be done using a combination of AnalookW (Chris Corben) Kaleidoscope Pro. Calls will be initially filtered based on a minimum of four pulses per 10 seconds within a call.

d. Bat calls will be classified to species level using self-designed filters in AnalookW based on call parameters from Monadjem et al. 2020.

e. All calls will be manually checked and adjusted if any calls are incorrectly identified by the filters.

f. When considering bat activity over a given area, due to the bat detectors being stationary, to lessen the bias of a single individual being recorded multiple times and over-representing activity, all bat passes will be standardised to Activity Index (AI) based on Miller (2001).

g. The data will be presented as activity index (AI) per species in each “active” minute interval.

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Aquatic Biodiversity Specialist Assessment

Objectives

The principal aims of an aquatic assessment will be to determine how the development will impact on the aquatic ecological integrity of the area by:

a. identifying, describing and delineating any wetlands, pans and/or watercourses in the study area,

b. demarcating appropriate ecological buffers along adjacent wetlands, pans and/or watercourses, and

c. undertaking a Risk Assessment of certain activities associated with the development (to determine if S21(c) and (i) water uses can be authorised under a General Authorisation.

Methodology

a. Riparian Delineation & Scientific Buffer determination

b. Assess the ecological status, importance and sensitivity of the site as required for section 21 (c) and (i) water uses by the Department of Water and Sanitation (DWS)

c. Flow and sediment regimes

d. Riparian habitat surveys (Riparian Vegetation Index — VEGRAI)

e. Riparian and in-stream Habitat: The habitat indices to be used in this survey are the Invertebrate Habitat Assessment System (IHAS) and the Habitat Quality Index (HQI). Sites will be evaluated according to the Index of Habitat Integrity (IHI) model. For the fish section the Habitat Cover Ratings (HCR) and Site Fish Habitat Integrity Index (SHI) were also applied.

f. Biota - Aquatic surveys:

    i. Aquatic habitat assessments

    ii. Macro-invertebrates - SASS5 for invertebrates

    iii. Fish - FRAI-based surveys

g. Water quality in relation to the flow regime, including the Biological: Macro Invertebrate Response Assessment Index (MIRAI).

h. The Risk Assessment will be done in accordance with the Risk Matrix (Based on DWS 2014 publication: Section 21 (c) and (i) water use Risk Assessment Protocol and as contained as Appendix A in GN509 of 26 August 2016).

i. A cumulative impact assessment of the proposed development shall also be performed, by comparing the Department's Renewable Energy EIA Application Data (https://egis.environment.gov.za/renewable_energy) with the latest Google Earth satellite imagery to identify and assess only those Solar PV facilities that have been developed within 30km of this development (Phase 3).

j. Mitigation and/or management measures.

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Agricultural Agro-Ecosystem Specialist Assessment

Objectives of the Grazing component

The principle objectives of the Grazing component is to establish the Grazing potential within the study area, which provides guidelines for development on the distribution of sensitive areas, based on information from soil mapping and classification by Hennie van den Berg (IRIS International) as well as Grazing management guidelines, based on veld condition.

Methodology

Pre-fieldwork stratification

A total of 11 fixed points will be stratified within the study area based on different ecological units identified on Google Earth and/or within the soil and wetland delineation by Van den Berg (2017), as well as in the buffer area.

Veld Condition Assessment

a) Grass Composition

The method of Tainton (1977) will be used to assess veld condition from the composition and abundance of grasses within the Decreaser and Increaser ecological categories. Grass composition and grass species frequency abundance will be assessed from 100 sampling sites within an area 2m x 50m. The grass species closest to the monitoring rod is recorded at each of the 100 intervals. The number of grass species are listed with the total of frequency recorded for each species. Grass species are then grouped according to ecological categories Increasers and Decreasers. The proportion between Decreasers, Increasers 1 and Increasers 2 is an important key to understand the condition of the veld and to decide on appropriate applications of grazing management strategies that would be in line with management objectives.

b) Grass Tuft Distances (Water Catchment Potential)

Tuft distances will be assessed by measuring the distance between the monitoring rod and the nearest rooted part of the grass tufts (Point-to-Tuft Distance). A total of 100 measurements will be taken at the same transect line where grass species composition is surveyed. The closest rooted part of the grass tuft to the randomly placed monitoring rod is measured and expressed as average distance in cm.

c) Grass Phytomass

Grass phytomass is recorded by the use of the disc pasture meter (Bransby and Tainton, 1977). The calibration formula to convert compressed height to mass per area by Trollope and Potgieter (1986) will be used. The disc meter is dropped vertically on the grass layer and the settling height of the disc meter was recorded at each of 100 step points within a 100 m² area. Average compressed height (cm) will be converted to kg/ha.

d) Vegetation crown cover

Vegetation crown cover recorded by Van den Berg (2017), including records of cover from dominant vegetation species would be used with detailed observations in the grazing report to model potential grazing capacity.

Grazing Assessment

Potential grazing capacity, based on different ecological units identified within the soil and wetland delineation, is estimated for the study area. Information based on the Veld condition, Vegetation crown

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cover, including records of cover from dominant vegetation species, soil mapping and classification as well as the rainfall of the recent rainfall season will also be considered.

Objectives of the Soil component

The main objectives of the soil component are to determine how the proposed development (and its separate elements) will impact on the soil, particularly the agricultural production capability of the soil (expressed as land capability values) of the site. As well as to model and map the terrain units, soil patterns and land capability values.

Methodology

Pre fieldwork broad soil and terrain pattern stratification of the study area

Satellite imagery will be downloaded and enhanced to maximise visible soil and vegetation patterns. 30 Meter resolution elevation data will be interpolated to 10m resolution. Terrain morphology will be mapped from the enhanced data. Terrain wetness will also be extracted from the data and a hydrological analysis will be done. The satellite data and terrain data will be used to stratify broad soil and terrain patterns. Available geological data in combination with the existing soil map for Phase 1 will also be used to understand potential soil patterns. Potential field observation sites will be placed on the broad stratification of soil patterns.

In field observations of soil and vegetation patterns

The preselected observation sites will be visited in the field and soils will be classified according to the Soil Taxonomic System for South Africa (Blue Book). Additional soil parameters e.g., clay content for each horizon and soil depth will be recorded. The dominant and significant plant species at each soil observation site will also be recorded based on an estimation of the crown canopy cover for each species.

Construction of a field database

All the recorded soil parameters and vegetation data will be entered into a digital database linked to the vector field sites.

Soil, land capability and ecological unit maps

The field database will be used to refine the broad pre-field soil patterns into soil maps. In collaboration with the rangeland team soil and terrain patterns will be consolidated into ecological units. Land capability maps will be created from the soil and slope maps. Land capability assessments will be done.

Physical Aspect

Geotechnical Assessment

The principal aim of the geotechnical assessment will be to determine the suitability of the alternative footprints for founding stability of the Solar PV system, including transmission lines to the on-site substation on phase 2, as well as, where applicable, demarcate any no-go areas with appropriate buffers.

Objectives

The main objectives of the geotechnical assessment is to conduct a study covering the geotechnical aspects of the Phase 3 footprint area in order to: Identify, describe and map the different soil and rock

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formations, determine the topographical and drainage variation, identify possible sources of both road construction materials and concrete aggregate, assess the perceived impacts foundation conditions may have on the construction and operation phases of the proposed development and recommend mitigation measures and make recommendations regarding the location of the proposed footprints, including no go and buffer areas.

Methodology

a. Visit the project area and assess topography, accessibility and surface geological deposits across the 4 terrains forming part of the site namely:
    i. the Phase 3 terrain,
    ii. the (53 Ha) westwards extension to the Phase 2 terrain,
    iii. the (0,99 Ha) Laydown area terrain west of the Phase 1 terrain, and
    iv. the planned Eskom overhead line route (8,1 km) connecting the substations of Phases 1, 2 & 3.
b. Observe topography, accessibility and surface geological deposits across the terrains to assess geotechnical conditions for the planned solar farm from a geotechnical viewpoint. Observations will include hand auger profiling and dynamic penetrometer testing as adjudged necessary.
c. Evaluate site observations and photographs.
d. Write a geotechnical report detailing investigation steps, geotechnical findings and recommendations for detailed geotechnical investigations. The present study will indicate possible no-go areas and buffer zones where applicable and will also refer to data from existing (regional scale) geological maps of the area.

Hydrology Assessment

Objectives

The principal aims of hydrology assessment will be to determine how the development will impact the surface water hydrology of the area, compile a stormwater management plan for the solar PV facility, and inform the General Authorisation for S21(c) and (i) water uses associated with existing road crossings that need to be widened and potential transmission corridors through watercourses.

Methodology

Based on the desktop evaluation of the site, the following key areas need to be assessed as part of a full hydrology assessment:

a. Likely impact on the hydrology of the non-perennial streams (and ecological areas) downstream of Area 1 and 2 (both quantity and quality);
b. Likely impacts on flood hydrology of the non-perennial streams/drainage lines; and
c. Likely impacts on sedimentation and stormwater generated from the installation of PV panels (e.g., increased runoff impacts and stormwater generation impacts).

The above mentioned would need to be included in a dedicated hydrology report, with a risk assessment matrix applied to quantify the risk to the hydrological environment (construction and operational phase).

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The following is proposed to supplement the hydrology report, and to inform the risk assessment:

a. Site walkover assessment:

   The aim is to confirm and evaluate the non-perennial drainage lines at the site, and to obtain water samples from the ephemeral stream (where possible) to quantify the baseline surface water quality for the area.

b. Flood line assessment:

   Confirmation of peak flows pre-and post-development and the impact on the flood hydrology of the non-perennial streams associated with the site. Exclusion zones will be identified, and 1:50 and 1:100-year flood lines will be generated (pre-development).

c. Conceptual stormwater management plan (CSWMP):

   A CSWMP needs to be developed to manage runoff and potential sedimentation of the non-perennial streams/drainage lines. The implications on stormwater generation from the PV panels need to be established.

d. Risk assessment:

   Description of all surface water impacts and proposed mitigation measures, using GCS' standard EIA Risk and Mitigation methodology.

e. Surface water monitoring plan:

   Depending on the availability of water (and samples taken in the walkover assessment), a surface water monitoring plan will be formulated.

f. Hydrology report:

   A project close-out report detailing the results of the hydrological will be written; and recommendations will be made for additional work and data requirements if needed.

Geohydrological Assessment

The proposed development falls within quaternary catchment D62D of the Orange Water Management Area (WMA) (DWS, 2016). The topography of the study area is generally flat with elevations on the site typically ranging from 1310 to 1370 metres above mean sea level. Five (5) hydrological response units (HRUs) describe the natural drainage for the study area.

There are a multitude of non-perennial drainage lines, which drain towards the non-perennial Brak River, situated approximately 6km downstream west of the site. No recognised non-perennial streams are associated with the site. There are several in-stream water storage dams associated with the non-perennial streams in the study area. Several known wind pumps are situated in the development area and are primarily used for livestock watering.

Objectives

The geo-hydrological study will aim to identify the in-situ geo-hydrological conditions of the site and focus on:

a. evaluating existing groundwater users;

b. identifying potential borehole drilling positions;

c. evaluating aquifer types; and

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d. potential impacts on the groundwater regime, groundwater aquifer, existing water users and surrounding water bodies.

The main objectives of the geo-hydrological report will be to determine how all three phases will impact their respective or shared underground aquifers, specifically:

a. Determine if there is enough groundwater to support demand during construction and operation;

b. Investigate the feasibility of drilling an additional borehole and recommend more reliable technologies than the existing wind pumps to mitigate the risk of a lowering water table;

c. Inform the Water Use License Application (WULA) for abstraction from boreholes;

d. Identify and quantify the perceived impacts and propose mitigations; and

e. A cumulative impact assessment of the Solar PV facility.

Methodology

The Best Practice Guidelines for Impact Prediction (G4) (Department of Water Affairs and Forestry [DWAF], 2008) were considered to define and understand the basic components of the geo-hydrological risk associated with the site activities. The approach will be used to assess how the existing and proposed site activities could impact groundwater quality and quantity and will include the following:

a. Literature review

b. Field investigation

i. Reconnaissance survey of the project area

- A site visit and walk over of the proposed site; and
- A field hydro census will be carried out within a radius of 1km of the project. Groundwater resources (geosites) will be verified and mapped. The hydro census will identify and confirm existing water use in the area. Each resource will be visited, and the condition assessed.

ii. Borehole yield testing

- Undertake 4-6-hour yield tests on boreholes in the study area, fitted with pumps to establish 1st order yields using an auto logger; and
- If wind conditions allow it (e.g., for wind pumps), the yield of other boreholes.

iii. Borehole siting

- A Geo-physical investigation will be carried out to locate several priority drilling positions within target areas identified during the desk study and site assessment via magnetic methods.

iv. Water quality sampling:

- Four (4) water samples will be collected and analysed for inorganic and organic constituents.

c. Drilling feasibility

A drilling priority rating will be developed for potential drilling sites. The probability of getting water at the sited points will be discussed in the report including recommended drilling depths and borehole construction.

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d. Site conceptual model

A site conceptual geo-hydrological model will be developed, based on field and desktop gathered geo-hydrological data.

e. Groundwater reserve assessment

Intermediate Groundwater Reserve Determination (IGRD) will be conducted for the study area to establish the groundwater reserve.

f. Risk assessments

The significance of potential geo-hydrological impacts will be assessed. Each impact identified for the construction and operational phase will be assessed in terms of probability (likelihood of occurring), scale (spatial scale), magnitude (severity) and duration (temporal scale).

g. Monitoring plan

The monitoring network will be based on the principles of a monitoring network design as described by the DWAF Best Practice Guidelines: G3 Monitoring (DWAF, 2007). A groundwater monitoring program that presents water quality constituencies to be analysed, the frequency of sampling, and the locality of sampling points will be drafted. This plan will include the construction and operational phase monitoring.

Socio-economic Aspect

Socio-Economic Impact Assessment

One of the ways in which social risk can be managed is by conducting a social impact assessment (SIA). Such an assessment can assist with identifying possible social impacts and risks. Disregarding social impacts can alter the cost-benefit equation of development and in some cases even undermine the overall viability of a project. A proper social impact assessment can have many benefits for a proposed development (UNEP, 2002) such as:

a. Reduced impacts on communities of individuals;

b. Enhanced benefits to those affected;

c. Avoiding delays and obstruction – helps to gain development approval (social license);

d. Lowered costs;

e. Better community and stakeholder relations; and

f. Improved proposals.

Objectives

The purpose of the Socio-Economic Impact Assessment is to provide baseline information regarding the socio-economic environment, to identify possible social and economic risks/fatal flaws and to suggest ways in which these impacts can be mitigated. This will assist decision-makers on the project in making informed decisions by providing information on the potential or actual consequences of their proposed activities.

The process entailed the following:

a. A baseline socio-economic description of the affected environment;

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b. Identification of potential social and economic change processes that may occur as a result of the project including but not limited to the decrease in property value of surrounding farms; and

c. Identification of potential social and economic impacts including active engagement (interviews) with sensitive receptors such as neighbors which could potentially be subjected to visual impacts as identified in the Visual Impact Assessment.

Methodology

Scoping Level Assessment

The Scoping level assessment includes the following:

a. A desktop description of the baseline receiving environment specific to the field of expertise (general surrounding as well as site specific environment);

b. Key issues related to specialist area that need to be addressed in the EIA; and

c. Terms of reference for Social Impact Assessment.

EIA/EMP Level Assessment

The EIA level assessment will include the following:

a. Update of Baseline Information as determined post Scoping Phase;

b. A detailed social impact assessment based on the proposed activities and the alternatives identified during the Scoping Phase;

c. Identification and description of sensitivities and constraints from a social perspective;

d. Include 'need and desirability' taking into account the social and economic aspects;

e. Make recommendations with regard to the planning, construction and operation of the proposed development that will benefit all stakeholders, including the community;

f. Contribution to the preparation of an EMP relating to the specific field of expertise and impacts identified;

g. Providing detailed mitigation / management measures for the management of the identified impacts for inclusion in the EMP.

h. Based on the needs of the community, make suggestions on effective corporate social responsibility projects that can be undertaken by the developer.

The information used in the report will be based on the following:

a. A literature review (see list provided in the References);

b. Data from Statistics South Africa; and

c. Professional judgement based on experience gained with similar projects.

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Visual Impact Assessment

Objectives and *Methodology*

The process that the specialist follows when undertaking a VIA is based on the United States Bureau of Land Management 's (BLM) Visual Resource Management method (USDI., 2004). Specifically, the methodology involved: site survey; review of legal framework; determination of Zone of Visual Influence (ZVI); identification of Visual Issues and Visual Resources; assessment of Potential Visual Impacts including engagement with neighbours that could potentially be impacted on; and formulation of Mitigation Measures.

Baseline Analysis Stage

In terms of VRM methodology, landscape character is derived from a combination of *scenic quality*, *receptor sensitivity* to landscape change and *distance* from the proposed landscape change. The objective of the analysis is to compile a mapped inventory of the visual resources found in the receiving landscape, and to derive a mapped Visual Resource sensitivity layer from which to evaluate the suitability of the landscape change.

a) Scenic Quality

The scenic quality is determined making use of the VRM Scenic Quality Checklist that identifies seven scenic quality criteria which are rated with 1 (low) to 5 (high) scale. The seven scenic quality criteria are Landform, Vegetation, Water, Colour, Scarcity, Adjacent Land Use and owners, and Cultural Modifications.

b) Receptor Sensitivity

Receptor sensitivity to landscape change is determined by rating the following factors in terms of Low to High: Type of Users, Amount of Use, Public Interest, Adjacent Land Uses and owners Special Areas; and Other Factors.

c) Exposure/Distance

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined as 'the area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The areas where most landscape modifications would be visible are located within 2 km from the site of the landscape modification.

Distance from a landscape modification influences the size and clarity of the landscape modification viewing. The Bureau of Land Management defines three distance categories:

i. ***Foreground / Middle ground***, up to approximately 6km, which is where there is potential for the sense of place to change;

ii. ***Background areas***, from 6km to 24km, where there is some potential for change in the sense of place;

iii. ***Seldom seen areas***, which fall within the Foreground / Middle ground area but, as a result of no receptors, are not viewed or are seldom viewed.

d) Key Observation Points

During the Baseline Inventory Stage, Key Observation Points (KOPs) are identified. KOPs are defined as the people (receptors i.e. sensitive neighbours) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape

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modifications are proposed. To define the KOPs, potential receptor locations were identified in the viewshed analysis, and screened, based on the following criteria:

i. Angle of observation;
ii. Number of viewers;
iii. Length of time the project is in view;
iv. Relative project size (including appropriate buffers along property boundary);
v. Season of use;
vi. Critical viewpoints, e.g. views from neighbouring landowners, communities, road crossings; and
vii. Distance from property boundaries.

Assessment and Impact Stage

The assessment stage involves determining whether the potential visual impacts from proposed development will meet the management objectives established for the area, or whether design adjustments will be required. This requires a contrast rating to assess the expected DoC, the proposed landscape modifications would generate within the receiving landscape in order to define the Magnitude of the impact.

a) Contrast Rating

The contrast rating is undertaken to determine if the VRM Class Objectives are met. The suitability of landscape modification is assessed by comparing and contrasting existing receiving landscape to the expected contrast that the proposed landscape change will generate.

b) Photomontages

As a component in the contrast rating process, visual representation, such as photo montages are vital in large-scale modifications, as this serves to inform Interested & Affected Parties and decision-making authorities of the nature and extent of the impact associated with the proposed project/development.

Traffic Impact Assessment

It is noted that the Phase 1 Traffic Impact Statement concluded the following:

a. Traffic volumes along the N10 were obtained from SANRAL. These volumes indicate that the N10 carries very little traffic past the proposed site.
b. The anticipated traffic volumes that will be generated during the construction and operational phases of the project (Phase 1) will have an insignificant impact on the road network.

Objectives

The main objectives of the traffic impact assessment is to determine how the construction phase will impact on the traffic and roads of the area and affected properties, and suggest preferable alternatives, if applicable. As well as to identify and quantify the perceived impacts and propose mitigations to be included in the EMPr.

Element Consulting Engineers (Pty) Ltd was appointed by Soventix South Africa (Pty) Ltd to prepare a Traffic Impact Statement for the already approved development of Phase 1. The Traffic Impact Statement addressed the following for Phase 1: site location and description of the development, existing traffic conditions, trip generation and distribution as well as access arrangements.

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Methodology

As per the traffic engineer "A site visit will be undertaken by driving along the external access roads and visits to the proposed access points. We will try to do this during "peak hours' (early morning / late afternoon) to get a feel for the traffic volumes. We won't need to enter the premise, as the internal roads do not form part of the TIA."

Light construction vehicles (water truck, refuse removal truck) will use the proposed access. It is evident that even less traffic will be generated during the operational phase and will therefore not impact the existing traffic flow.

Heritage and Cultural Aspects

Archaeological & Cultural Heritage Specialist Assessment

The study and proposed development area is located in the Upper Nama Karoo (Nku3), vegetation of the region is limited by the low annual rainfall (ca. 190 - 200 mm/a) and is dominated by flat plain areas and hills with rocky outcrops. The geology is mostly Dwyka / Ecca shales overlaid with shallow sandy soils that drain well. In general, the topography of the study area is flat and open, with some rocky ridges/outcrops and low hills surrounding present. Tree cover is scarce, but fairly dense ground cover (grass/shrubs/bushes) in large sections did hamper visibility on the ground during the February 2021 assessment. The focus of the field assessment was therefore on large open patches of soil and erosion dongas, as well as the rocky ridges and outcrops.

In general, the area has not been disturbed by modern developments, except for a railway line, existing 132Kv Eskom Powerline corridors that cuts through the areas and have had some impact, with the largest other type of impact being agricultural activities (sheep/cattle; grazing and limited crop growing and ploughing). Farmsteads and related infrastructure are also present, but these will not be directly impacted by the proposed development actions.

Objectives

The objectives of the assessment would be to cover the areas where the proposed development activities will take place to determine if there are any possible cultural heritage (archaeological and/or historical) sites, feature or material located here and if these would be negatively impacted by the development. Should any be found and be deemed of significance then suitable measures to mitigate these impacts will be provided in the resultant Phase 1 HIA Report. These measures could include sampling of material and archaeological excavations that would require the obtaining of a permit from the South African Heritage Resources Agency. Numerous sites were identified in the area during earlier assessments (for Phase 1 and 2) and there is therefore a high likelihood that similar sites will be found during the assessment related to Phase 3.

Methodology

Previous archaeological and heritage assessments for the Goedehoop Solar PV Project (Phases 1 & 3) recorded a fairly large number of cultural heritage (archaeological & historical) resources of varying extent and significance in the area. These include scatters of open-air surface Stone Age sites, rock engravings, later agro-pastoralist stone-walled sites, as well as historical Anglo-Boer War (18990-1902)

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sites. These findings are clear evidence of the intrinsic heritage value of the area and the fact that further assessments would be required

The following methodology will be employed during the Archaeological & Heritage work related to this project should we be appointed to undertake the assessment:

a. Background research on the area where the development is planned, including information obtained during earlier (2016/17 and 2020) fieldwork for Phases 1 and 2.

b. A detailed assessment of the site area in order to try and identify and record any possible archaeological & historical (cultural heritage) sites, features and material that might be present Determining the possible impacts of the proposed development on any cultural heritage resources and recommending required mitigation measures if needed.

c. The results of the background research and physical field assessment will be reported on in a Phase1 Report and will be submitted to SAHRA and the client for comments.

Palaeontological Specialist Assessment

The Phase 3 project area is underlain at depth by potentially fossiliferous continental bedrocks of the Lower Beaufort Group (Karoo Supergroup) of Middle Permian age that have yielded sparse but scientifically important vertebrate remains in the Hanover area as well as commoner petrified wood. Also present are unfossiliferous dolerite intrusions and Late Caenozoic superficial sediments (e.g., alluvium, surface gravels) which might contain important fossil mammal and other remains as well as reworked fossil wood blocks. Satellite imagery suggests that bedrock exposure is limited but not insignificant within all three study sites. The three study sites have been provisionally assigned a Very High palaeosensitivity on the DFFE Screening Tool map, triggering a full desktop and field-based palaeontological assessment as well as a Site Sensitivity Verification Report.

The most likely outcome, based on comparable project areas in the Hanover - De Aar region of the Great Karoo, is that comparatively few scientifically useful fossil sites will be recorded, while No-Go palaeontological areas are very unlikely to be designated. Most Karoo fossil sites are of limited extent and can be effectively mitigated in the pre-construction phase, so palaeontological constraints on the project footprint are not anticipated, although they cannot be completely excluded in advance.

Objectives

The main objectives of the Palaeontological specialist assessment is to: determine how this development (and its separate elements) will impact on any palaeontological resources within the area, compile a brief contextualisation of the area's palaeontological history and all palaeontological resources, including a map that clearly demarcates sensitive sites, any no-go areas and associated buffers, assess the significance of the impact of the proposed development on the palaeontological resources within the area, to estimate the level of sensitivity/importance of the palaeontological resources within the area and to identify and quantify the perceived impacts and propose mitigations to be included in the EMPr.

Methodology

The approach to the palaeontological heritage study is briefly as follows:

a. Fossil bearing rock units occurring within the broader study area are determined from geological maps and satellite images.

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b. Known fossil heritage in each rock unit is inventoried from scientific literature, previous assessments of the broader study region, and the author's field experience and palaeontological database.

Based on this data as well as field examination of representative exposures of all major sedimentary rock units present, the impact significance of the proposed development is assessed with recommendations for any further studies or mitigation.

Consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following field assessment during the compilation of the final report. This data is then used to assess the palaeontological sensitivity of each rock unit to development. The likely impact of the proposed development on local fossil heritage is then determined on the basis of:

a. the palaeontological sensitivity of the rock units concerned and

b. the nature and scale of the development itself, most significantly the extent of fresh bedrock excavation envisaged.

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a Phase 1 field assessment study by a professional palaeontologist is usually warranted to identify any palaeontological hotspots and make specific recommendations for any monitoring or mitigation required before or during the construction phase of the development.

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Method of Assessing Duration and Significance

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(v) a description of the proposed method of assessing duration and significance;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Please refer to SECTION G above.

Stages of Consultation

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(vi) an indication of the stages at which the competent authority will be consulted;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Pre-application Enquiry Meeting Stage

A pre-consultation meeting will be held with DFFE prior to submitting (or uploading) the completed Application Form.

Application Stage

The completed Application Form and draft Scoping Report will be submitted simultaneously to the DFFE (for a 30-day comment period).

Scoping Report Stage

After 30 days the comments and responses received from I&AP's will be included in the final scoping report. The final scoping report will then be submitted to DFFE within the required 44 days from submitting the application form to DFFE. The DFFE must reach a decision on the proposed plan of study described in the final scoping report within 43 days.

Environmental Impact Assessment Report Stage

The draft EIA report will then be distributed to registered I&APs, including the competent authority (CA), for a 30-day comment prior to making any necessary revisions and submitting (or uploading) the final report within 106 days of the CA reaching a decision on the final scoping report.

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Public Participation Process during the Environmental Impact Assessment

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended.

Please refer to Section G: (ii) and (iii) Public Participation Process as well as the attached **Appendix E**: Public Participation Process Report. In summary, the following tasks will be completed:

a. Identify and engage with potential I&APs;
b. Allow potential I&APs at least 30 days to register;
c. Incorporate, where possible, I&AP concerns into the specialists' scope of work;
d. Address I&AP concerns in the impact assessment;
e. Distribute draft Scoping report to registered I&APs;
f. Incorporate I&AP comments into final Scoping Report;
g. Submission of Scoping Report to DFFE
h. Distribute draft EIR & EMPr to registered I&APs;
i. Incorporate I&AP comments into Final EIR & EMPr;
j. Submission of EIR & EMPr to DFFE;
k. DFFE notify applicant of EA;
l. EAP notifies registered I&APs of the CA's decision and opportunity to appeal.

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Tasks to be undertaken during the Environmental Impact Assessment

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended.

The principal tasks that will be undertaken during the Environmental Impact Assessment include:

a. Undertake the necessary specialist studies to address and assess key concerns or issues identified during the Scoping Study;
b. Identify the best practicable environmental option;
c. Incorporate all applicable management actions into an Environmental Management Programme;
d. Continued public participation process, specifically through the provision of draft reports for review and comment;
e. Represent all the information (including comments and responses) in an Environmental Impact Assessment Report to allow an informed decision to be taken concerning the proposed project; and
f. Ensure that the EIA complies with the requirements of NEMA and the EIA Regulations 2014, as amended.

Management Actions

2(1) A scoping report… must include –

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including –

(ix) Identify suitable measures to avoid, reverse, mitigate or manage identified impacts to determine the extent of the residential risks that need to be managed and monitored.

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Please refer to the mitigations prescribed in the Impact Assessment in **Appendix D**.

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SECTION I: AFFIRMATION BY THE EAP

2(1) A scoping report… must include –

(i) an undertaking under oath or affirmation by the EAP in relation to –

(i) the correctness of the information provided in the report;

(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and

(iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

EAP Affirmation

Appendix 2 Section 2 (i) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998, as amended - NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to the correctness of the information provided in the report, the inclusion of comments and inputs from stakeholders and interested and affected parties, and any information provided by the EAP to interested and affected parties as well as any responses by the EAP to comments or inputs made by interested or affected parties.

I, **Shannon Farnsworth**, on behalf of Ecoleges, hereby affirm that all information provided herein is to the best of my knowledge correct, all comments and inputs received from stakeholders and interested and affected parties have been accurately recorded herein (**Annexure E of the PPP Report attached as Appendix C**) and any information or responses provided by the EAP to comments or inputs made by interested or affected parties are recorded in the Comments and Response Report (**Annexure H of the PPP Report attached as Appendix C**).

Signature of the EAP

01st June 2022

Date

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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SECTION J: ENVIRONMENTAL IMPACT ASSESSMENT AGREEMENT BETWEEN EAP AND I&AP'S

2(1) A scoping report… must include –

(j) an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

EAP Affirmation

Appendix 2 Section 2 (k) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998, as amended - NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to the level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the environmental impact assessment.

I, **Shannon Farnsworth**, on behalf of Ecoleges, hereby affirm that all comments and inputs received from stakeholders and interested and affected parties have been accurately recorded herein and, insofar as comments are relevant and practicable, accommodated in the Plan of Study submitted with the final Scoping Report to the Competent Authority, thereby attaining a desirable level of agreement for undertaking the environmental impact assessment.

Signature of the EAP

01st June 2022

Date

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat.)
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SECTION K: SPECIFIC INFORMATION

2(1) A scoping report… must include –

(k) where applicable, any specific information required by the competent authority;

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended

Ms Constance Musemburi of the Directorate: Priority Infrastructure Projects (DFFE) requested a Section 24C(3) Agreement between the Minister of Forestry, Fisheries and the and Environment and the MEC for the Northern Cape's Department of Environment and Nature Conservation (DENC) (**Appendix F**).

SECTION L: OTHER MATTERS

2(1) A scoping report… must include –

(l) any other matter required in terms of section 24(4)(a) and (b) of the Act.

Appendix 2 (Content of the Scoping Report) of the EIA Regulations, 2014 as amended.

Not applicable

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BIBLIOGRAPHY

Avifauna Scoping Report and Plan of Study prepared by Enviro-Insight cc and dated April 2022.

Barron-Gafford G.A., et al (2016) "The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures" www.nature.com/scientificreports.

BirdLife website (https://www.birdlife.org.za/iba-directory/platberg-karoo-conservancy - page last updated Friday 13th February 2015).

BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 30 March 2022; http://datazone.birdlife.org/species/factsheet/ludwigs-bustard-neotis-ludwigii.

Cape Lowlands Environmental Services. June 2012. Final Environmental Impact Report for Saldanha Energy Park. P.O. Box 70, Darling, 7345.

DHS Redbook, Section J, Water Supply, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed July 2019.

DHS Redbook, Section K, Sanitation, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed January 2019.

DWAF (2004), General Authorisation in GN No. 399 published in Government Gazette No. 26187 dated 26 March 2004.

DWA (2007), Guideline for Developments within a Flood line (Edition 1), Department of Water Affairs and Forestry, Pretoria, South Africa.

DWAF (2009), General Authorisation in GN No. 1199 published in Government Gazette No. 32805 dated 18th December, 2009.

DWAF (1996) South African Water Quality Guidelines (second edition). Volume 1: Domestic Use.

DWAF (1996) South African Water Quality Guidelines (second edition). Volume 4: Agricultural Use: Irrigation.

Eskom's Transmission Bird Collision Prevention Guideline (Revision 1) effective date June 2010.

Eskom's Utilization of Bird Flight Diverters on Eskom Overhead Lines (Revision 1) authorised date July 2015.

Geotechnical Assessment Study prepared by FDJ Stapelberg of the Council for Geoscience dated 11 May 2022 (CO2017-5806 (Phase 80)).

Harald Winkler (Ed.), 2006. Energy policies for sustainable development in South Africa. Energy Research Centre, University of Cape Town.

Hydrological Assessment (Version – Final 2) 11 April 2022 GCS Project Number: 22-0076 by Hendrik Botha.

J. van Zalk & P. Behrens (2018). The spatial extent of renewable and non-renewable power generation: A review and meta-analysis of power densities and their application in the U.S., Energy Policy, Volume 123, Pages 83-91, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2018.08.023. (https://www.sciencedirect.com/science/article/pii/S0301421518305512).

L. Haack & M. Schlecht. Water saving potential of CSP-PV hybrid plants. AIP Conference Proceedings 2126, 220003 (2019); https://doi.org/10.1063/1.5117762 Published Online: 26 July 2019.

Mpandeli S, Naidoo D, Mabhaudhi T, Nhemachena C, Nhamo L, Liphadzi S, Hlahla S, Modi AT. Climate Change Adaptation through the Water-Energy-Food Nexus in Southern Africa. Int J Environ Res Public Health. 2018 Oct 19;15(10):2306. doi: 10.3390/ijerph15102306. PMID: 30347771; PMCID: PMC6210720.

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

National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, Commonwealth of Australia 2020.

Renewable Energy Generation Plant Setbacks to Eskom Infrastructure Revision 02 compiled on 15 September 2020 (Unique Identifier 240-65559775).

SANBI BGIS platform (http://bgis.sanbi.org/MapViewer).

SA Protected Areas and Conservation database (https://egis.environment.gov.za).

Screening Assessment Report, National Department of Forestry, Fisheries and Environment, compiled on 02 February 2022.

Shaw, J. 2013. Power line collisions in the Karoo conserving Ludwig's bustard. University of Cape Town.

Site Sensitivity Verification Report Final version 02 dated 04 April 2022.

Social Scoping Report prepared by Equispectives Research & Consulting Services dated April 2022.

Spatial Planning and Land Use Management Act (Act 16 of 2013).

Surveyor-General Property Search platform (https://csggis.drdlr.gov.za/psv/).

Visual Impact Assessment Plan of Study prepared by Stephen Stead of Visual Resource Management Africa cc dated 04 May 2022.

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LIST OF APPENDICES

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Appendix A: SITE PLAN

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Appendix B: SITE PHOTOGRAPHS

Photo 1. Herd of Merino Sheep grazing.

Photo 2. Signage at landowner's entrance gate.

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Photo 3. Existing 132kV ESKOM distribution line.

Photo 4. View facing Southwest of the wetland area near Borehole No.5 (30°49'33.98"S & 24°21'58.85"E).

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Photo 5. View facing West-southwest of an artificial pan located near Borehole No.4 (30˚ 49' 47.1'' S & 24˚ 20' 49.9'' E).

Photo 6. View facing East-northeast of a pan located at Borehole No.5 (30°49'31.01"S & 24°22'5.26"E).

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Photo 7. View facing southwest from the top edge of the ridge near Corner C.

Photo 8. View facing northwest of the grassland (or wetland) below the ridge near Corner C.

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Photo 9. View facing southwest from the centre of watercourse Road Crossing No.2 in the middle of the study area.

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Appendix C: PUBLIC PARTICIPATION PROCESS REPORT

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Appendix D: IMPACT ASSESSMENT

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Appendix E: SPECIALIST PLANS OF STUDY

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Appendix F: SPECIFIC INFORMATION REQUIRED BY COMPETENT AUTHORITY

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