



## **WONDERHEUVEL SOLAR POWER (PTY) LTD**

# **Proposed Development of the Wonderheuvel Solar Photovoltaic (PV) Energy Facility and Associated Infrastructure near Noupoot in the Northern Cape Province**


## **Final Environmental Impact Assessment Report (FEIAR)**

**DEFF Reference Number: 14/12/16/3/3/2/1135**

**Issue Date: 13 February 2020**

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**Project No.: 15324**

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## KEY PROJECT INFORMATION

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL (SG) CODE
Remainder of the Farm Mooi Plaats No. 121	C03000000000012100000
Portion 3 of the Farm Wonder Heuvel No. 140	C03000000000014000003
Portion 5 of the Farm Holle Fountain No. 133	C03000000000013300005

WONDERHEUVEL SOLAR PV ENERGY FACILITY: APPLICATION SITE		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	SOUTH	EAST
A	S31° 17' 1.287"	E24° 42' 4.865"
B	S31° 17' 20.791"	E24° 44' 9.956"
C	S31° 18' 52.051"	E24° 43' 59.011"
D	S31° 18' 51.516"	E24° 45' 40.385"
E	S31° 19' 24.462"	E24° 45' 44.745"
F	S31° 20' 29.169"	E24° 43' 58.727"
G	S31° 20' 23.791"	E24° 43' 37.331"
H	S31° 22' 16.277"	E24° 41' 19.097"
I	S31° 23' 14.558"	E24° 40' 23.671"
J	S31° 23' 1.162"	E24° 39' 53.952"
K	S31° 23' 15.310"	E24° 38' 49.721"
L	S31° 20' 20.615"	E24° 39' 26.979"
M	S31° 20' 4.494"	E24° 40' 19.428"
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	SOUTH	EAST
P	S31° 20' 3.011"	E24° 41' 58.521"

WONDERHEUVEL SOLAR PV ENERGY FACILITY: PV ARRAY AREAS			
PHASE	AREA (HECTARES)	CENTRE POINT COORDINATES	
		SOUTH	EAST
PV ARRAY AREA 1	190.14	S31° 19' 20.917"	E24° 42' 27.573"
PV ARRAY AREA 2	154.64	S31° 19' 35.099"	E24° 42' 50.975"
PV ARRAY AREA 3	142.39	S31° 20' 14.911"	E24° 42' 26.343"
PV ARRAY AREA 4	45.22	S31° 19' 58.191"	E24° 41' 1.625"

PV ARRAY AREA 5	165.71	S31° 21' 11.854"	E24° 39' 50.368"
PV ARRAY AREA 6	164.25	S31° 21' 21.094"	E24° 41' 29.433"

The PV array areas have a vast number of bend / corner point coordinates and therefore only the centre point coordinates have been provided in this report. A full list of all bend / corner point coordinates for the respective PV array areas is however provided in **Appendix 9A**.

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED SUBSTATION ALTERNATIVE COORDINATES</b>		
<b>SUBSTATION 4A (CENTRAL COLLECTOR)</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
SUB4a_01	S31° 21' 29.869"	E24° 41' 42.062"
SUB4a_02	S31° 21' 30.007"	E24° 41' 49.718"
SUB4a_03	S31° 21' 36.422"	E24° 41' 49.562"
SUB4a_04	S31° 21' 36.285"	E24° 41' 41.905"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 33.146"	E24° 41' 45.812"
<b>SUBSTATION 4B</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
SUB4b_01	S31° 21' 39.983"	E24° 40' 13.440"
SUB4b_02	S31° 21' 40.122"	E24° 40' 21.096"
SUB4b_03	S31° 21' 46.538"	E24° 40' 20.938"
SUB4b_04	S31° 21' 46.399"	E24° 40' 13.282"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 43.261"	E24° 40' 17.189"

The substation sites are intrinsically linked to the associated electrical infrastructure development [part of a separate on-going Basic Assessment (BA) process with **DEFF Ref No.: 14/12/16/3/3/1/2134**] and have been informed by the grid connection infrastructure alternatives which have been chosen as 'preferred' by the respective specialists. In addition, the proposed substations include an Eskom portion and an IPP portion, hence the substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA to allow for handover to Eskom. This has been explained in the **Executive Summary** and **section 8** of this Final Environmental Impact Assessment Report (FEIAR).

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED LAYDOWN AREA SITE ALTERNATIVES</b>
<b>LAYDOWN AREA OPTION 1</b>
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>

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<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED LAYDOWN AREA SITE ALTERNATIVES</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
LD1_01	S31° 19' 33.531"	E24° 43' 28.813"
LD1_02	S31° 19' 33.667"	E24° 43' 36.467"
LD1_03	S31° 19' 40.082"	E24° 43' 36.313"
LD1_04	S31° 19' 39.947"	E24° 43' 28.658"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 19' 36.807"	E24° 43' 32.563"
<b>LAYDOWN AREA OPTION 2</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
LD2_01	S31° 20' 9.761"	E24° 43' 1.128"
LD2_02	S31° 20' 9.897"	E24° 43' 8.782"
LD2_03	S31° 20' 16.313"	E24° 43' 8.628"
LD2_04	S31° 20' 16.177"	E24° 43' 0.973"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 20' 13.037"	E24° 43' 4.878"
<b>LAYDOWN AREA OPTION 3</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
LD3_01	S31° 21' 37.231"	E24° 41' 31.293"
LD3_02	S31° 21' 37.369"	E24° 41' 38.949"
LD3_03	S31° 21' 43.784"	E24° 41' 38.793"
LD3_04	S31° 21' 43.646"	E24° 41' 31.136"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 40.508"	E24° 41' 35.043"
<b>LAYDOWN AREA OPTION 4</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
LD4_01	S31° 21' 39.777"	E24° 40' 5.586"
LD4_02	S31° 21' 39.916"	E24° 40' 13.242"

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED LAYDOWN AREA SITE ALTERNATIVES</b>		
LD4_03	S31° 21' 46.331"	E24° 40' 13.084"
LD4_04	S31° 21' 46.192"	E24° 40' 5.427"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 43.054"	E24° 40' 9.335"

*It should be noted that each PV array area will require a laydown / staging area. However, certain PV array areas will share laydown / staging areas. As such, up to a maximum of four (4) laydown / staging areas are being proposed for authorisation. These locations were informed by the comparative assessment of layout alternatives and have taken environmental sensitivities and 'no-go' areas into consideration. It should however be noted that it is unlikely that the applicant will make use of all of the authorised laydown / staging areas, as some PV array areas may share laydown / staging areas. The applicant has requested that the maximum number of laydown areas be authorised as a precaution, should all of the authorised laydown / staging areas be required. The number of laydown / staging areas will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).*

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED O&amp;M BUILDING SITE ALTERNATIVES</b>		
<b>O&amp;M BUILDING SITE OPTION 1</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
OM1_01	S31° 19' 39.995"	E24° 43' 28.583"
OM1_02	S31° 19' 40.053"	E24° 43' 31.825"
OM1_03	S31° 19' 43.995"	E24° 43' 31.730"
OM1_04	S31° 19' 43.938"	E24° 43' 28.488"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 19' 41.995"	E24° 43' 30.157"
<b>O&amp;M BUILDING SITE OPTION 2</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
OM2_01	S31° 20' 12.267"	E24° 43' 8.934"
OM2_02	S31° 20' 12.324"	E24° 43' 12.176"
OM2_03	S31° 20' 16.266"	E24° 43' 12.081"
OM2_04	S31° 20' 16.209"	E24° 43' 8.839"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 20' 14.267"	E24° 43' 10.508"

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED O&amp;M BUILDING SITE ALTERNATIVES</b>		
<b>O&amp;M BUILDING SITE OPTION 3</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
OM3_01	S31° 21' 23.092"	E24° 41' 51.841"
OM3_02	S31° 21' 23.150"	E24° 41' 55.084"
OM3_03	S31° 21' 27.092"	E24° 41' 54.988"
OM3_04	S31° 21' 27.034"	E24° 41' 51.745"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 25.092"	E24° 41' 53.415"
<b>O&amp;M BUILDING SITE OPTION 4</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
OM4_01	S31° 21' 35.048"	E24° 40' 15.437"
OM4_02	S31° 21' 35.107"	E24° 40' 18.679"
OM4_03	S31° 21' 39.049"	E24° 40' 18.582"
OM4_04	S31° 21' 38.990"	E24° 40' 15.339"
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>SOUTH</b>	<b>SOUTH</b>	<b>SOUTH</b>
CENTRE	S31° 21' 37.048"	E24° 40' 17.009"

*It should be noted that each PV array area will require an O&M building. However, certain PV array areas will share O&M buildings. As such, up to a maximum of four (4) O&M building sites are being proposed for authorisation. These locations were informed by the comparative assessment of layout alternatives and have taken environmental sensitivities and 'no-go' areas into consideration. It should however be noted that it is unlikely that the applicant will construct all of the authorised O&M buildings, as some PV array areas may share O&M buildings. The applicant has requested that the maximum number of O&M buildings be authorised as a precaution, should all of the authorised O&M buildings be required. The number of O&M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).*

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY – INTERNAL ROADS</b>			
<b>ROAD 1</b>			
<b>INTERNAL ROAD COORDINATES (DD MM SS.sss) - CENTRE LINE</b>			
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>	<b>APPROX LENGTH (KM)</b>
START	S31° 18' 51.551"	E24° 45' 33.811"	12.27
MID POINT	S31° 20' 49.959"	E24° 42' 51.426"	
END	S31° 23' 13.079"	E24° 40' 20.273"	
<b>ROAD 2</b>			

WONDERHEUVEL SOLAR PV ENERGY FACILITY – INTERNAL ROADS			
INTERNAL ROAD COORDINATES (DD MM SS.sss) - CENTRE LINE			
POINT	SOUTH	EAST	APPROX LENGTH (KM)
START	S31° 18' 56.785"	E24° 43' 48.815"	5.15
MID POINT	S31° 19' 2.512"	E24° 42' 17.731"	
END	S31° 20' 7.591"	E24° 41' 24.249"	

Refer to **Appendix 9A** for the full list of coordinates.

**TITLE DEEDS:** Title Deeds are provided in **Appendix 9D**.

**PHOTOGRAPHS OF SITE:**





**Figure i: General characteristics of the study area**

The entire study area is largely in a natural state but used for animal production. There is well-established farm infrastructure on each landholding, including homesteads, farm buildings, camps, dams, small areas of cultivated lands, and some stands of exotic trees used as shade and windscreens. There are also access roads, narrow gravel roads, jeep tracks and fences. The vegetation in the study area is used primarily for livestock grazing and is affected to some degree by this usage, but not to the extent that any severe degradation was noted on-site. Except for this infrastructure, the vegetation and habitats in the study area appear to be largely in a natural state. This natural pattern extends beyond the study area in all directions and gives the general area a sense of being relatively untransformed and largely natural. The topography within the application site is generally mildly undulating with a few localised ridges and koppies scattered across the site. There are a number of scattered outcrops/boulders across the site (especially in the north-western corner of the site). A hilly / mountainous region was identified in the north-eastern section of the site. A prominent ridge was also identified in the north-western section of the site. Steep slopes may be expected in these areas.

**TYPE OF TECHNOLOGY:** Solar Photovoltaic (PV).



**STRUCTURE HEIGHT:** Each PV module will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. It should be noted that final design details are yet to be confirmed. These details will become available during the detailed design phase of the proposed development.

**SURFACE AREA TO BE COVERED:** The total area of the application site assessed in the scoping phase is approximately 5 652 hectares (ha). The proposed solar PV energy facility (including all associated infrastructure) is however expected to occupy less than 1000ha of the application site. The proposed on-site and collector substations will each occupy an area of up to approximately 4ha. The four (4) proposed temporary construction laydown / staging areas will occupy an area of approximately 4ha each<sup>1</sup>, while the four (4) Operation and Maintenance (O&M) buildings will occupy a site of approximately 1ha each<sup>1</sup>. It should be noted that the final design details are yet to be confirmed. These details will become available during the detailed design phase of the proposed development.

**PV DESIGN:** The proposed solar PV energy facility will comprise of PV modules which will be either fixed-tilt mounting or single-axis tracking mounting (**Figure ii**). In addition, the modules will be either crystalline silicon or thin-film technology. The modules will be mounted in rows on support structures. Each module will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. The on-site substations and collector substations will contain transformers for voltage step-up from medium voltage to high voltage. Direct Current (DC) power from the modules will be converted into Alternating Current (AC) power in the inverters and the voltage will be stepped up to medium voltage in the inverter transformers. Medium voltage cabling will link the PV plant to the grid connection infrastructure (on-site substations, collector substations and 132kV overhead power line) (**Figure iii**). These cables will be laid underground wherever technically feasible.

**STRUCTURE ORIENTATION:** At this stage it is anticipated that the structures will be north-facing. The final orientation will however be confirmed during the detailed design phase of the proposed development.

**FOUNDATIONS:** The foundations will most likely be either concrete or rammed piles. The final foundation design will be determined at the detailed design phase of the proposed development.

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<sup>1</sup> It should be noted that it is unlikely that the applicant will construct or make use of all of the authorised laydown / staging areas and O&M buildings, as certain PV array areas may share laydown / staging areas and O&M buildings (where possible). The applicant has requested that the maximum number of laydown / staging areas and O&M buildings be authorised as a precaution, should all of these be required. The number of laydown / staging areas and O&M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing)

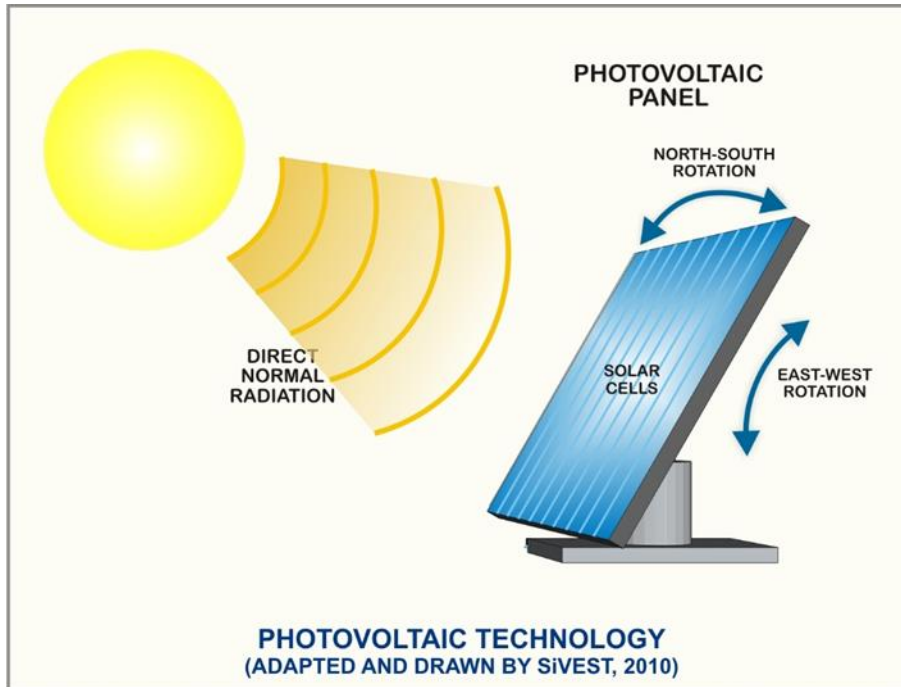


Figure ii: Typical components of a solar PV Panel

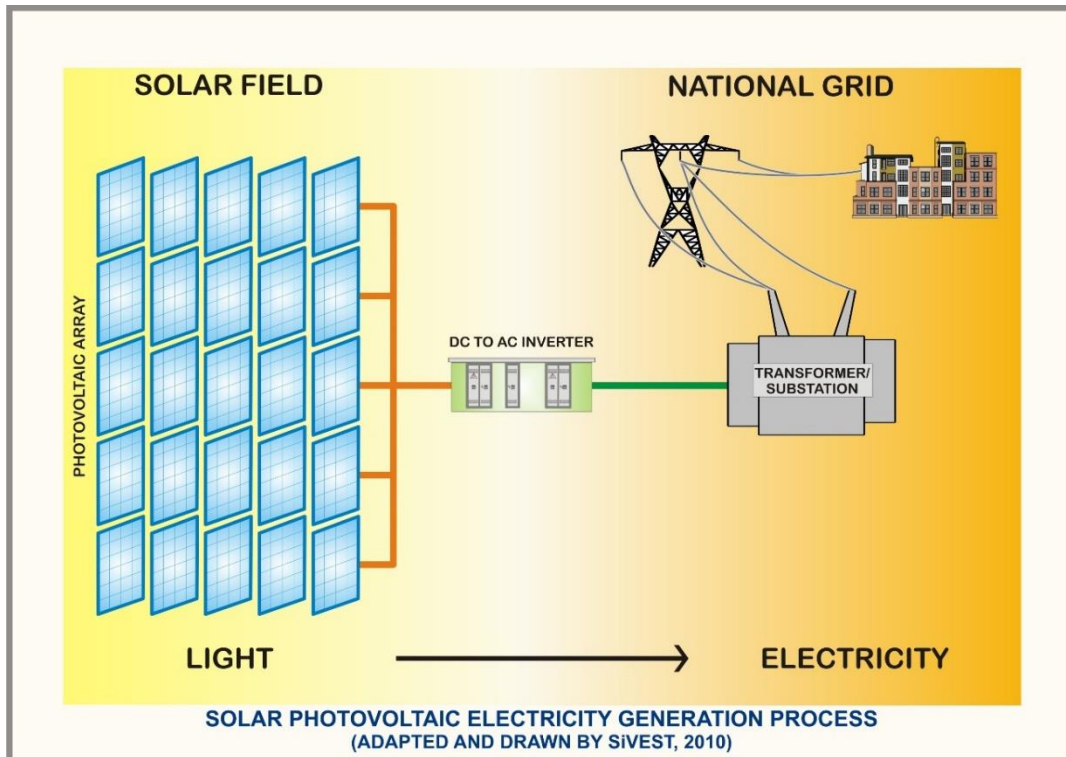


Figure iii: Conceptual PV electricity generation process showing electrical connections

**LAYDOWN AREA DIMENSIONS:** Each proposed PV array area will require a temporary construction laydown / staging area. However, certain PV array areas will share laydown / staging areas. As such, up to

a maximum of four (4) temporary construction laydown / staging areas which will occupy an area of approximately 4ha each are being proposed for authorisation. However, as mentioned, it is unlikely that the applicant will make use of all of the authorised laydown / staging areas, as certain PV array areas may share laydown / staging areas (where possible). The applicant has requested that the maximum number of laydown / staging areas be authorised as a precaution, should all of these be required. The number of laydown / staging areas will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).

**GENERATION CAPACITY:** The proposed development will have a maximum total generation capacity of up to approximately 480MW.

**TECHNICAL DETAILS:**

Component	Description / Dimensions
Generation capacity	Maximum of up to approx. 480MW
Capacity of the on-site and collector substations	33/132kV
Number of modules	Approx. 1 371 429
Area occupied by each module	Approx. 2m <sup>2</sup> per module
Dimensions of panels	2m wide and between 1m and 4m in height, depending on mounting type
Max module height from the ground (i.e. PV module height)	Between 1m and 4m
Area of the application site (as assessed in the scoping phase)	Approx. 5 652ha
Area of PV array	Approx. 862.35ha
Maximum number of inverters required	Maximum of approx. 3 200
Footprint of on-site and collector substations	Up to approx. 4ha each. Only two (2) substations [one (1) on-site and one (1) collector substation] are being proposed for authorisation, with a total combined footprint of approx. 8ha
Footprint of O&M building(s)	<p>Approx. 1ha per O&amp;M building. Each proposed PV array area will require an O&amp;M building. However, certain PV array areas will share O&amp;M buildings. Four (4) O&amp;M buildings are thus being proposed for authorisation, with a total combined footprint of approx. 4ha.</p> <p>As mentioned, it is unlikely that the applicant will construct all of the authorised O&amp;M buildings, as certain PV array areas may share O&amp;M buildings (where possible). The applicant has requested that the maximum number of O&amp;M buildings be authorised as a precaution, should all of these be required. The number of O&amp;M buildings will be refined (if required) prior to the</p>



Component	Description / Dimensions
	final layout plan being submitted to the Department for approval (prior to construction commencing).
Area of temporary construction laydown / staging areas	<p>Each proposed PV array area will require a temporary construction laydown / staging area. However, certain PV array areas will share temporary laydown / staging areas. Four (4) temporary construction laydown / staging areas, each occupying an area of approx. 4ha, are thus being proposed for authorisation. Therefore a total combined footprint of approx. 16ha.</p> <p>As mentioned, it is unlikely that the applicant will make use of all of the authorised laydown / staging areas, as certain PV array areas may share laydown / staging areas (where possible). The applicant has requested that the maximum number of laydown / staging areas be authorised as a precaution, should all of these be required. The number of laydown / staging areas will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).</p>
Area occupied by buildings	<p>Approx. 12ha, should all of the authorised O&amp;M buildings be constructed.</p> <p>As mentioned, it is unlikely that the applicant will construct all of the authorised O&amp;M buildings, as certain PV array areas may share O&amp;M buildings (where possible). The applicant has requested that the maximum number of O&amp;M buildings be authorised as a precaution, should all of these be required. The number of O&amp;M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).</p>
Width of internal roads	Up to 14m during construction (to be partly rehabilitated) and between 4m and 12m during operation. Existing site roads will be used wherever possible. However, where required, internal access roads will be constructed
Length of internal roads	Up to approx. 17.5km. Final lengths however to be confirmed once Engineering, Procurement and Construction (EPC) contractor has been selected and the design is finalised.
Site Access	Access to the facility will be via the existing gravel road (DR2433) which bisects the proposed PV facility. The road bisects the development into two (2) unequal quadrants, a north-eastern and south-western quadrant. Two (2) access points

Component	Description / Dimensions
	have been identified and the final position of these access points will be dependent on the location of the PV fields in relation to the DR2433.
Proximity to grid connection	<p><b>Although the substations form part of this application, the power line is not part of this EIA, and is being applied for as part of a separate on-going Basic Assessment (BA) process (DEFF Ref No.: <u>14/12/16/3/3/1/2134</u>).</b></p> <p>Grid connection is to the Hydra D Main Transmission Substation (MTS)<sup>2</sup>, which will still be constructed, based on the preference for the overhead power line corridor route proposed as part of the electrical infrastructure BA (part of a separate on-going BA process with <b>DEFF Ref No.:</b> <u>14/12/16/3/3/1/2134</u>). The proposed location for the Hydra D MTS is approx. 6.2km south-east of the application site.</p>
Height of fencing	Approx. 2m high
Type of fencing	Galvanised steel

The final design details of the proposed solar PV energy facility and associated infrastructure will become available during the detailed design phase of the proposed development, after the proposed development has been selected as a Preferred Bidder project under the Department of Energy's (DoE's) Renewable Energy Independent Power Producers Procurement Programme (REIPPPP).

All maps included in the report are included in **Appendix 5**.

<sup>2</sup> Originally formed part of Umsobomvu WEF (14/12/16/3/3/2/730) which was issued with an EA on 17 February 2017. EA however split into three (3) separate EAs, namely Umsobomvu I WEF (14/12/16/3/3/2/730/AM2), Coleskop WEF (14/12/16/3/3/2/730/1/AM2) and Eskom Infrastructure MTS (14/12/16/3/3/2/730/2) (which includes Eskom Hydra D MTS)

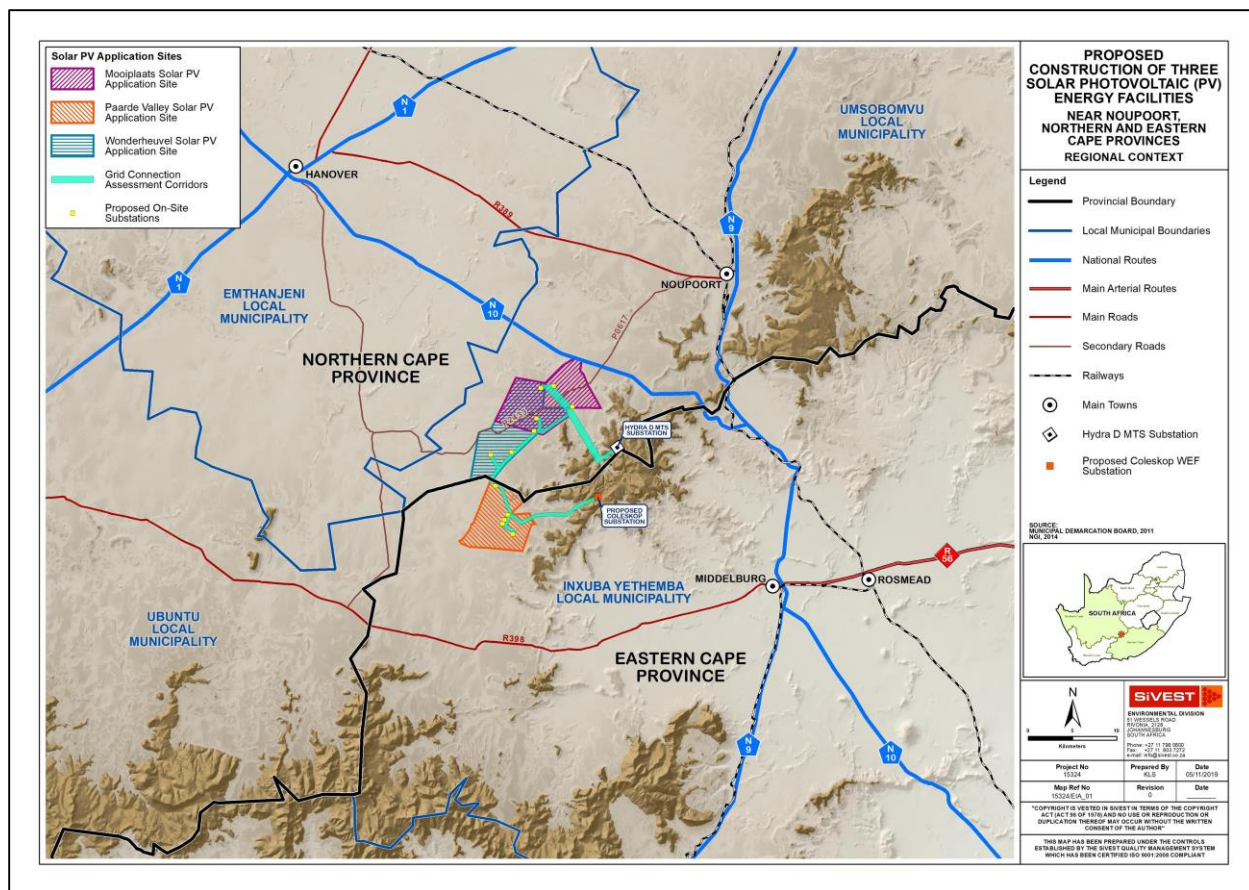
## **EXECUTIVE SUMMARY**

Wonderheuvel Solar Power (Pty) Ltd (hereafter referred to as Wonderheuvel Solar Power) is proposing to construct the Wonderheuvel Solar PV Energy Facility and associated infrastructure near Noupoort in the Northern Cape Province of South Africa (hereafter referred to as the 'proposed development') (**DEFF Reference Number: 14/12/16/3/3/2/1135**). It should be noted that the proposed development will have a maximum generation capacity of up to approximately 480 Megawatts (MW). The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid.

The above-mentioned proposed solar PV energy facility forms one (1) of three (3) solar PV energy facilities that are being proposed on adjacent farms as part of the greater Umsobomvu PV project (**Figure iv**). The other proposed developments which form part of the greater Umsobomvu PV project include the following:

- Mooi Plaats Solar PV – **DEFF Reference Number: 14/12/16/3/3/2/1134** (part of a separate on-going EIA process); and
- Paarde Valley Solar PV – **DEFF Reference Number: 14/12/16/3/3/2/1136** (part of a separate on-going EIA process).

In addition, a 132kV overhead power line and 33/132kV on-site and collector substations (namely the associated electrical infrastructure) are also being proposed to feed the electricity generated by the proposed Wonderheuvel Solar PV Energy Facility into the national grid. The above-mentioned associated electrical infrastructure will however require a separate Environmental Authorisation (EA) and is subject to a separate Basic Assessment (BA) process (**DEFF Reference Number: 14/12/16/3/3/1/2134**). The associated electrical infrastructure has been included in the solar PV energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The on-site and collector substations will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substations have been included in the solar PV energy facility EIA and in the associated electrical infrastructure BA to allow for handover to Eskom. Although the solar PV energy facility and associated electrical infrastructure will be assessed separately, a single public participation process is being undertaken for all the proposed developments [i.e. three (3) solar PV energy facility EIAs and three (3) grid connection BAs]. The potential environmental impacts associated with all of the developments have been assessed as part of the cumulative impact assessment.



**Figure iv:** Regional context of greater Umsobomvu PV project

In terms of the EIA Regulations, which were published on 4 December 2014 and amended on 7 April 2017, various aspects of the proposed Wonderheuveld Solar PV Energy Facility development were considered listed activities which may have an impact on the environment and therefore require authorisation from the National Department of Environment, Forestry and Fisheries (DEFF) prior to the commencement of such activities. However, the provincial authority has also been consulted (i.e. the Northern Cape Department of Environment and Nature Conservation - NC DENC).

SiVEST SA (Pty) Ltd Environmental Division has been appointed by Wonderheuveld Solar Power as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process for the proposed construction and operation of the Wonderheuveld Solar PV Energy Facility and associated infrastructure.

Due to the fact that the proposed development is not located within any of the Renewable Energy Development Zones (REDZs) formally gazetted<sup>3</sup> in South Africa for the purpose of development of solar and wind energy generation facilities, the Wonderheuveld Solar PV Energy Facility was subject to a full EIA process in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, and the EIA Regulations, 2014 (as amended).

<sup>3</sup> Formally gazetted on 16 February 2018 (government notice 114)

All relevant legislation and guidelines (including Equator Principles) have been consulted during the EIA process and were complied with at all times.

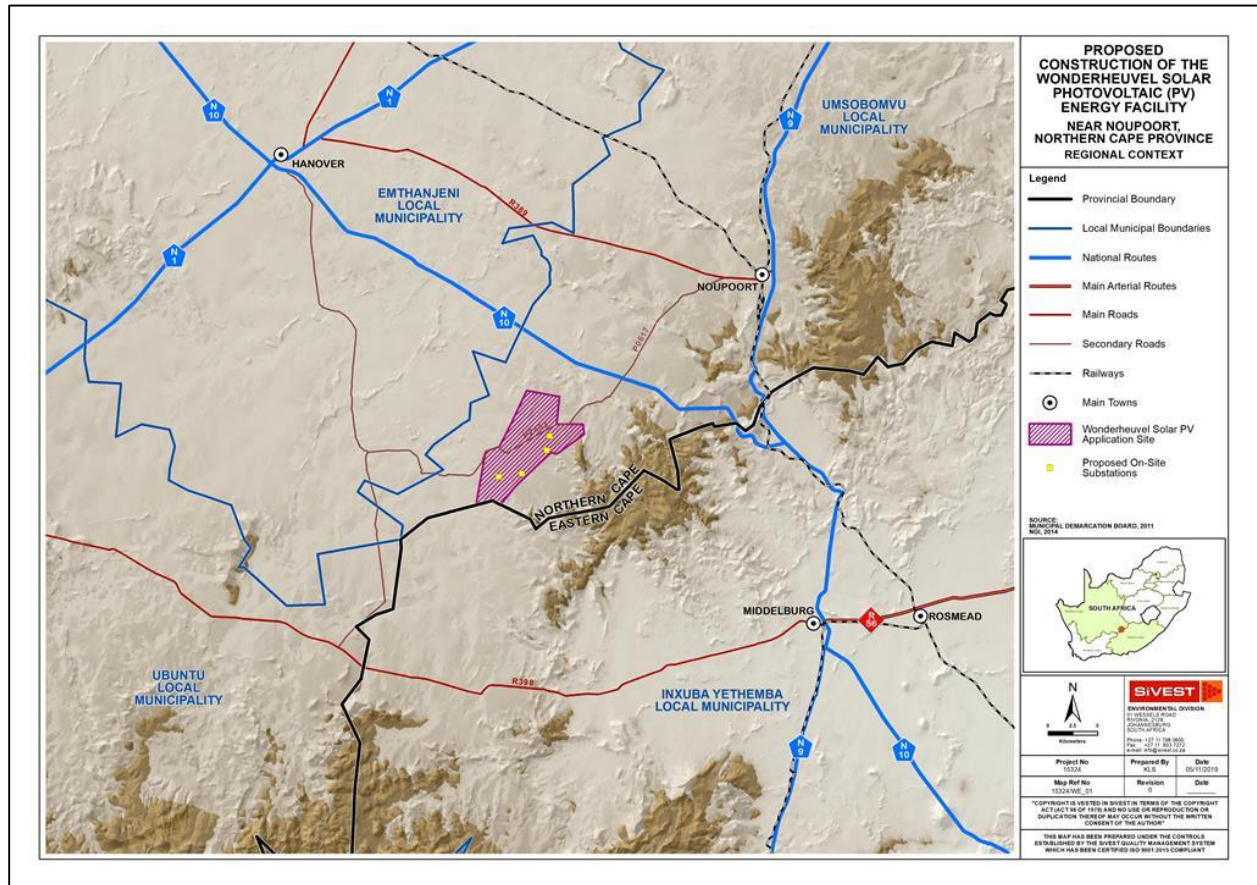


Figure v: Wonderheuvvel Solar PV Energy Facility in the regional context

WONDERHEUVEL SOLAR PV ENERGY FACILITY: APPLICATION SITE		
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	SOUTH	EAST
P	S31° 20' 3.011"	E24° 41' 58.521"

WONDERHEUVEL SOLAR PV ENERGY FACILITY: PV ARRAY AREAS			
PHASE	AREA (HECTARES)	CENTRE POINT COORDINATES	
		SOUTH	EAST
PV ARRAY AREA 1	190.14	S31° 19' 20.917"	E24° 42' 27.573"
PV ARRAY AREA 2	154.64	S31° 19' 35.099"	E24° 42' 50.975"
PV ARRAY AREA 3	142.39	S31° 20' 14.911"	E24° 42' 26.343"

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PV ARRAY AREAS</b>			
PV ARRAY AREA 4	45.22	S31° 19' 58.191"	E24° 41' 1.625"
PV ARRAY AREA 5	165.71	S31° 21' 11.854"	E24° 39' 50.368"
PV ARRAY AREA 6	164.25	S31° 21' 21.094"	E24° 41' 29.433"

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED SUBSTATION ALTERNATIVE COORDINATES</b>		
<b>SUBSTATION 4A (CENTRAL COLLECTOR SUBSTATION)</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 33.146"	E24° 41' 45.812"
<b>SUBSTATION 4B (ON-SITE SUBSTATION)</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 43.261"	E24° 40' 17.189"

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED LAYDOWN AREA SITE ALTERNATIVES</b>		
<b>LAYDOWN AREA OPTION 1</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 19' 36.807"	E24° 43' 32.563"
<b>LAYDOWN AREA OPTION 2</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 20' 13.037"	E24° 43' 4.878"
<b>LAYDOWN AREA OPTION 3</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 40.508"	E24° 41' 35.043"
<b>LAYDOWN AREA OPTION 4</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
CENTRE	S31° 21' 43.054"	E24° 40' 9.335"

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: PREFERRED O&amp;M BUILDING SITE ALTERNATIVES</b>		
<b>O&amp;M BUILDING SITE OPTION 1</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		

POINT	SOUTH	EAST
CENTRE	S31° 19' 41.995"	E24° 43' 30.157"
<b>O&amp;M BUILDING SITE OPTION 2</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
POINT	SOUTH	EAST
CENTRE	S31° 20' 14.267"	E24° 43' 10.508"
<b>O&amp;M BUILDING SITE OPTION 3</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
POINT	SOUTH	EAST
CENTRE	S31° 21' 25.092"	E24° 41' 53.415"
<b>O&amp;M BUILDING SITE OPTION 4</b>		
<b>CENTRE POINT COORDINATES (DD MM SS.sss)</b>		
POINT	SOUTH	EAST
CENTRE	S31° 21' 37.048"	E24° 40' 17.009"

Refer to **Appendix 9A** for the full list of project coordinates.

The proposed solar PV energy facility is located approximately 23km southwest of Noupoot, in the Northern Cape Province. The application site assessed in the scoping phase incorporates three (3) farm portions (namely Remainder of the Farm Mooi Plaats No. 121, Portion 3 of the Farm Wonder Heuvel No. 140 and Portion 5 of the Farm Holle Fountain No. 133) within the Umsobomvu Local Municipality, in the Pixley ka Seme District Municipality, and is approximately 5 652ha in extent. The proposed solar PV energy facility (including all associated infrastructure) is however expected to occupy less than 1000ha of the application site.

At this stage, it is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising of up to approximately 1 371 429 PV modules, with each module occupying an area of approximately 2m<sup>2</sup>. In addition, the proposed solar PV energy facility will have a maximum total generation capacity of up to approximately 480MW. The associated infrastructure would include, but is not limited to, internal access roads, one (1) on-site 33/132kV substation, one (1) 33/132kV collector substation, four (4) Operation and Maintenance (O&M) buildings and four (4) temporary laydown / staging areas<sup>4</sup>. As mentioned, the electricity generated by the solar PV energy facility will be fed into the national grid via a 132kV overhead power line (part of a separate BA process with **DEFF Ref No.:** 14/12/16/3/3/1/2134). In

<sup>4</sup> It should be noted that it is unlikely that the applicant will construct or make use of all of the authorised laydown / staging areas and O&M buildings, as certain PV array areas may share laydown / staging areas and O&M buildings (where possible). The applicant has requested that the maximum number of laydown / staging areas and O&M buildings be authorised as a precaution, should all of these be required. The number of laydown / staging areas and O&M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing)



summary, the proposed Wonderheuvvel Solar PV Energy Facility and associated infrastructure will include the following components:

- PV modules will be either fixed-tilt mounting or single-axis tracking mounting, and the modules will be either crystalline silicon or thin-film technology. Each module will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type.
- Internal roads, between 4m and 12m wide, will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.
- Temporary construction laydown / staging areas will be provided for each PV array area. However, certain PV array areas will share laydown / staging areas. Up to a maximum of four (4) temporary construction laydown/staging areas of approximately 4ha each are thus being proposed for authorisation. As mentioned, it is unlikely that the applicant will make use of all of the authorised laydown / staging areas, as certain PV array areas may share laydown / staging areas (where possible). The applicant has requested that the maximum number of laydown / staging areas be authorised as a precaution, should all of these be required. The number of laydown / staging areas will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).
- O&M buildings will be provided for each PV array area, occupying a site of approximately 1ha each. As such, up to a maximum of four (4) O&M buildings are being proposed for authorisation, with a combined total footprint of approximately 4ha. As mentioned, it is unlikely that the applicant will construct all of the authorised O&M buildings, as certain PV array areas may share O&M buildings (where possible). The applicant has requested that the maximum number of O&M buildings be authorised as a precaution, should all of these be required. The number of O&M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).
- Medium voltage cabling will link the PV facility to the grid connection infrastructure (132kV overhead power line, on-site substations and collector substations). These cables will be laid underground wherever technically feasible.
- One (1) new 33/132kV on-site substation and one (1) new collector substation, each occupying an area of up to approximately 4ha. The proposed substations will be step-up substations and will include an Eskom portion and an IPP portion, hence the on-site and collector substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA to allow for handover to Eskom.

The following assessments were conducted prior to and during the Scoping Phase to identify and assess the issues associated with the proposed development:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment (incl. pre-construction monitoring);
- Surface Water Impact Assessment;
- Desktop Agricultural and Soils Impact Assessment;
- Desktop Geotechnical Impact Assessment;
- Visual Impact Assessment;



- Heritage Impact Assessment;
- Palaeontology Impact Assessment;
- Desktop Social Impact Assessment; and
- Transportation Impact Assessment.

The above-mentioned studies were also undertaken to inform the impact assessment which took place in the EIA phase of the proposed development. In the scoping phase, the specialists assessed the entire application site. During the EIA phase, once the layout of the solar PV energy facility had been determined, the above-mentioned specialist assessments were updated / revised to focus on specific impacts of the proposed PV array / development areas and solar PV energy facility infrastructure in detail. The updates / revisions included the following (where required):

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV array areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

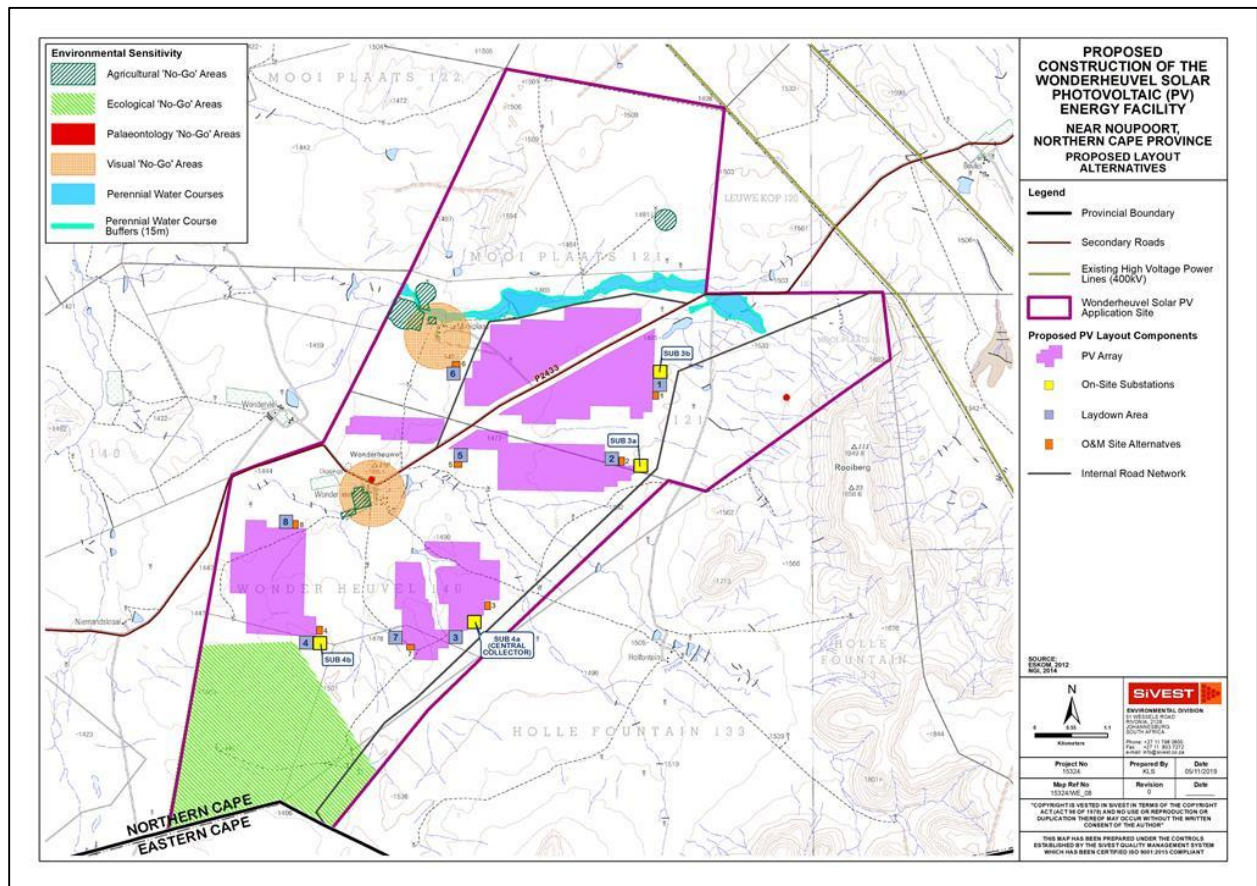
It should be noted that the Heritage Impact Assessment was originally undertaken via desktop means, however, following the desktop assessment, it was identified that further field truthing would need to be undertaken through an archaeological walk down. The aim of this was to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the Environmental Management Programme (EMPr). This field truthing exercise was subsequently undertaken in August 2019 and the results have been incorporated into this Final Environmental Impact Assessment Report (FEIAR), as well as the updated Heritage Impact Assessment Report (**Appendix 6D**).

Based on the specialist assessments which were conducted, a few potentially sensitive areas have been identified within the application site. These sensitive areas were subsequently used during the scoping phase to inform the area for the potential erection of PV modules within the application site (referred to as the proposed PV development area)<sup>5</sup>. In addition, the proposed PV development area that was presented in the Draft Scoping Report (DSR) and Final Scoping Report (FSR) was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure alternatives which were investigated in the EIA phase. The sensitive areas also informed the assessment of layout alternatives (included in **section 8**) which have been further assessed during the EIA phase. The layout alternatives which were identified and assessed during the EIA phase include location alternatives for laydown / staging areas and O&M buildings.

The proposed PV array areas (including layout alternatives which were investigated and comparatively assessed in the EIA phase) in relation to the identified environmental sensitive areas are presented in **Figure vi** below.

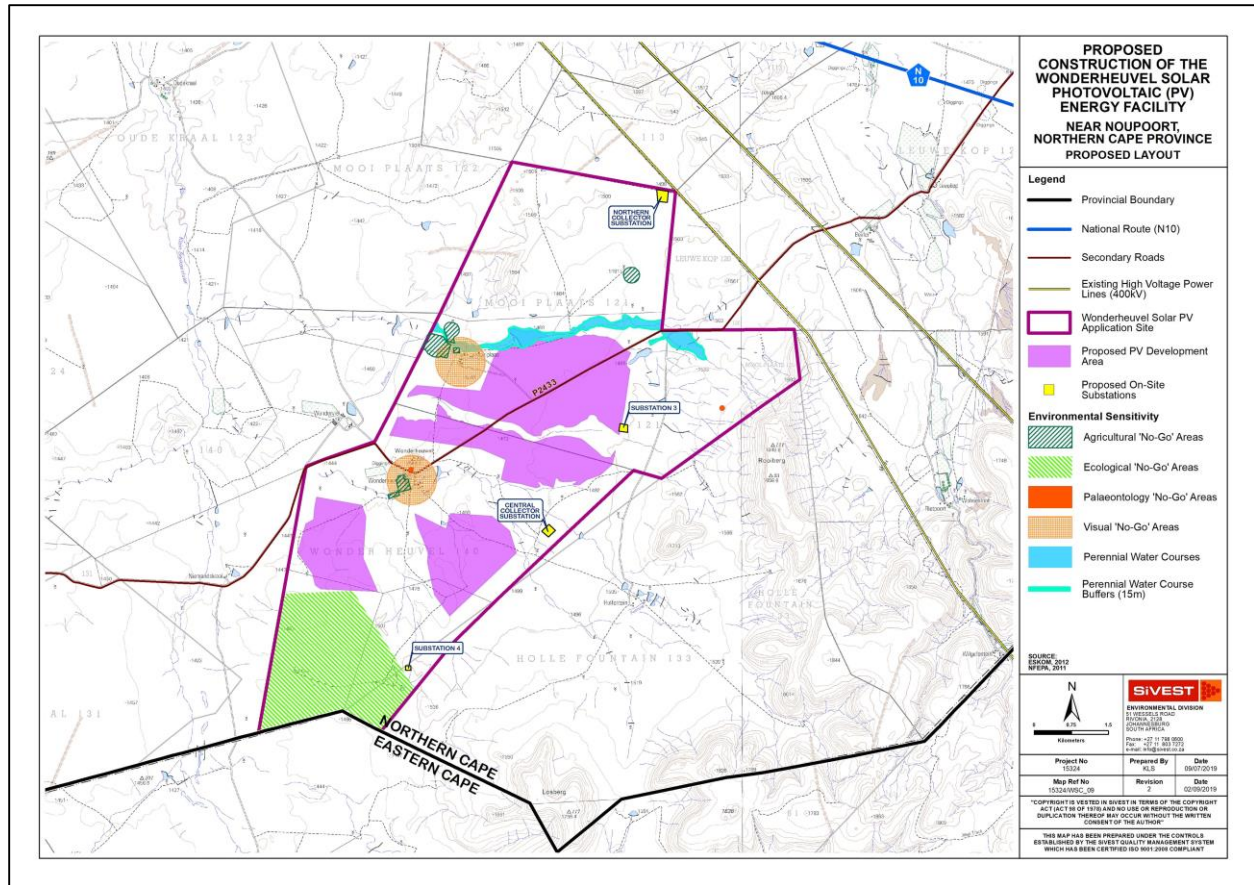
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<sup>5</sup> PV modules will not necessarily be erected in the entire proposed PV development area, particularly where PV modules cannot be placed (e.g. under the existing 400kV transmission lines)



**Figure vi:** Proposed PV array areas and layout alternatives for associated infrastructure in relation to environmental sensitive areas

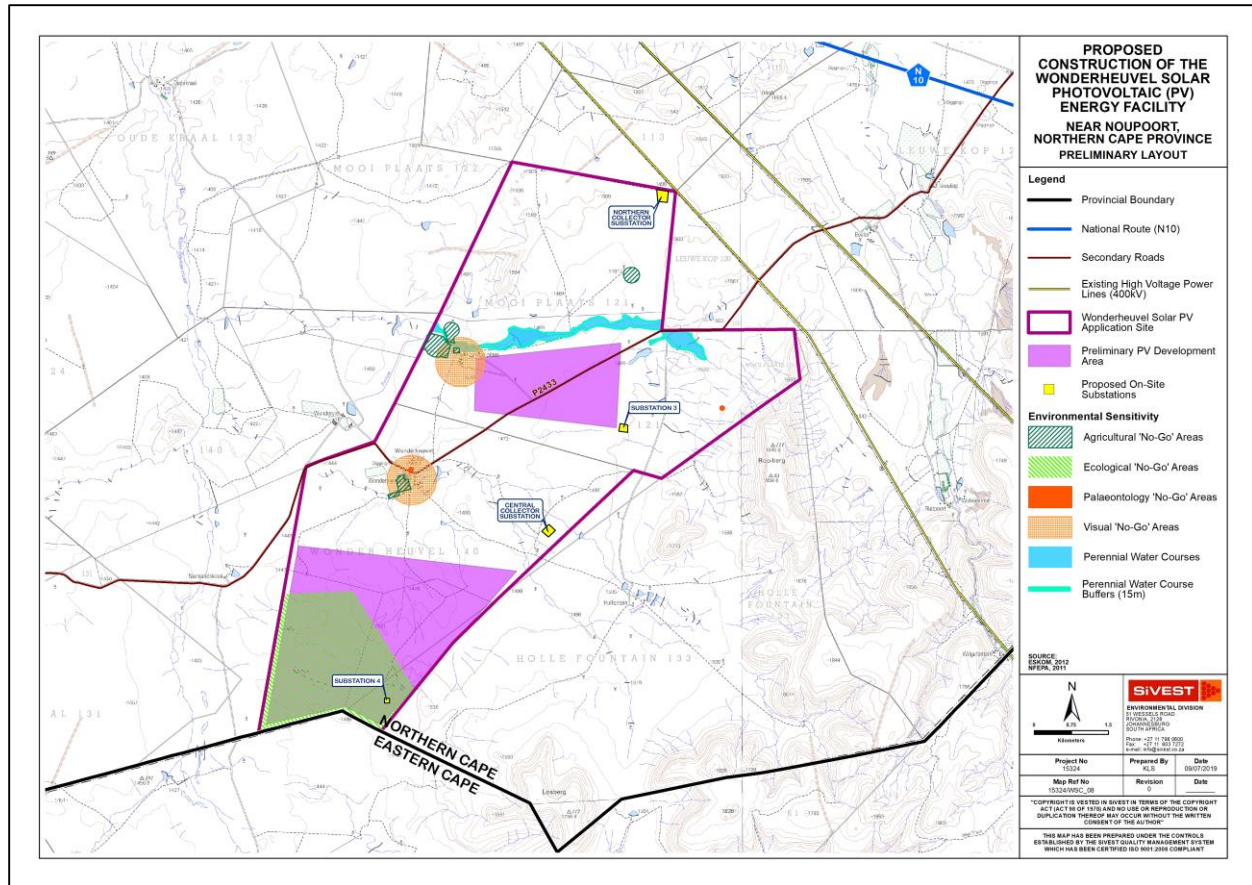
It should be noted that prior to the submission of the DSR, a preliminary PV development area was considered by the applicant. However, in order to ensure that the proposed development avoids the sensitive areas identified by the specialists, the preliminary PV development area was subsequently amended. In addition, the PV development area was further refined following the submission of the DSR and prior to the submission of the FSR. The refined proposed PV development area which was presented in the scoping phase (namely in the FSR) is presented in **Figure vii** below.



**Figure vii:** Proposed PV development area presented in scoping phase in relation to identified environmental sensitive areas

During the scoping phase the preliminary PV development area was comparatively assessed with the proposed PV development area (**Figure vii**), which was informed by the identified sensitive areas and presented in the scoping phase, in order to confirm that it would be 'preferred' from an environmental perspective. Based on the results of the comparative assessment of the above-mentioned PV development areas, it was concluded that the proposed refined PV development area which was presented in the scoping phase was preferred from an environmental perspective when compared to the preliminary PV development area. As mentioned, the proposed PV development area that was presented in the DSR and FSR was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure which were investigated in the EIA phase. The results of the comparative assessment of the PV areas is provided in **section 8.1**. A map showing the preliminary PV development area in relation to the identified environmental sensitive areas is provided in **Figure viii** below.





**Figure viii:** Preliminary PV development area in relation to identified environmental sensitive areas

As previously mentioned, layout alternatives (**Figure vi**) were identified and comparatively assessed during the EIA phase. These included alternative locations for the laydown / staging areas and O&M buildings<sup>6</sup>. These were informed by the identified environmental sensitive areas. All alternatives were assessed against the 'no-go' alternative (i.e. *status quo*). The results of the comparative assessment of layout alternatives are summarised in **Table i** below and are also presented in **section 8.2** of this FEIAr.

<sup>6</sup> Although the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process with **DEFF Ref No.: 14/12/16/3/3/1/2134**), the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the substation sites proposed as part of this EIA application. As such, the results of the comparative assessment of grid connection infrastructure alternatives have been provided in this report to provide information regarding the substations proposed as part of this EIA application.

**Key**

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>NOT PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

**Table i:** Summary of comparative assessment of layout alternatives for Wonderheuveld Solar PV Energy Facility

ALTERNATIVE	ENVIRONMENTAL ASPECT											FATAL FLAW (YES / NO)	PREFERRED (YES / NO)
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage			
<b>TEMPORARY LAYDOWN / STAGING AREA AND OPERATION &amp; MAINTENANCE (O&amp;M) BUILDING SITE ALTERNATIVES</b>													
Laydown and Building Option 1	Area O&M Site	Favourable	Preferred	Favourable	Favourable	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 2	Area O&M Site	Favourable	Preferred	Favourable	Favourable	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 3	Area O&M Site	Least Preferred	Preferred	Favourable	Preferred	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 4	Area O&M Site	Favourable	Preferred	Favourable	Preferred	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 5	Area O&M Site	Favourable	Least Preferred	Favourable	Favourable	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	NO	NO
Laydown and Building Option 6	Area O&M Site	Favourable	Least Preferred	Least Preferred	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	NO	NO
Laydown and Building Option 7	Area O&M Site	Least Preferred	Least Preferred	Favourable	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	NO	NO

ALTERNATIVE	ENVIRONMENTAL ASPECT											FATAL FLAW (YES / NO)	PREFERRED (YES / NO)	
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage				
<b>TEMPORARY LAYDOWN / STAGING AREA AND OPERATION &amp; MAINTENANCE (O&amp;M) BUILDING SITE ALTERNATIVES</b>														
Building Option 7														
Laydown and Building Option 8	Area O&M Site	Favourable	Least Preferred	Least Preferred	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	NO	NO	

As depicted in **Table i** above, majority of the specialists found there to be 'No Preference' between the alternatives, with the only exceptions being the Terrestrial Ecology, Surface Water, Visual, Geotechnical and Social specialists respectively. However, **Laydown Area and O&M Building Site Option 1, Option 2, Option 3 and Option 4** were found to be the most preferred alternatives from an environmental perspective as they were found to be either 'Preferred', Favourable' or have 'No Preference'. Option 3 was found to be 'Least Preferred' from a Terrestrial Ecology perspective due to the fact that it is in a drainage line, however, the Surface Water, Geotechnical and Social specialists found this alternative to be 'Preferred'. In addition, the Surface Water specialist stated that this alternative will be close to or within disturbance corridors for the power lines and will result in a low impact. As such, Option 3 is still considered to be an environmentally acceptable alternative. In addition, no fatal flaws were identified. Laydown Area and O&M Building Site Options 5 – 8 are considered to be the least preferred alternatives from an environmental perspective as these were found to be 'Least Preferred' from the most specialists. Option 5 was 'Least Preferred' from both Surface Water and Social perspectives, while Options 6 and 8 were found to be 'Least Preferred' from Surface Water, Visual and Social perspectives respectively. Option 7 is 'Least Preferred' from Terrestrial Ecology, Surface Water and Social perspectives. In light of this, **Laydown Area and O&M Building Site Option 1, Option 2, Option 3 and Option 4 are the most preferred layout alternatives from an environmental perspective and are being proposed for authorisation**. It should be noted that no fatal flaws were identified and therefore Laydown Area and O&M Building Site Options 1 – 4 are considered to be acceptable alternatives.

It should be noted that three (3) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have also been comparatively assessed by the respective specialists<sup>7</sup>. These alternatives essentially provide for three (3) different route alignments with associated substations (on-site and collector) contained within an assessment corridor between approximately 400m and 900m wide. This is to allow for flexibility to route the power line on either side of the existing high voltage Eskom power lines. It should be noted that the substation sites included as part of this application are intrinsically linked to the associated electrical infrastructure project (part of a separate BA process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). The results of the comparative assessment of grid connection infrastructure alternatives have however been provided in this report as the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the on-site and collector substation sites being proposed as part of this EIA application.

The results of the comparative assessment of grid connection infrastructure alternatives from the specialist assessments are summarised in **table ii** below.

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<sup>7</sup> Based on the pre-application meeting held with the DEFF on 19 February 2019, it was confirmed that the specialists could compile one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects as well as the three (3) associated grid infrastructure developments (on-site substation sites, collector substation sites and 132kV power line corridors), provided the findings and impact assessment sections are project-specific. A copy of the pre-application meeting minutes is provided in **Appendix 9B**

**Table ii:** Summary of comparative assessment of layout alternatives for Wonderheuvél Grid Connection Infrastructure

ALTERNATIVE	ENVIRONMENTAL ASPECT										FATAL FLAW (YES / NO)	PREFERRED (YES / NO)
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage		
<b>GRID CONNECTION INFRASTRUCTURE (132kV POWER LINE AND ON-SITE AND COLLECTOR SUBSTATIONS) ALTERNATIVES</b>												
Grid Connection Option 1a	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1b	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1c	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1d	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 2a	Preferred	Favourable	Favourable	Preferred	Preferred	Favourable	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>
Grid Connection Option 2b	Preferred	Favourable	Favourable	Preferred	Preferred	Favourable	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>
Grid Connection Option 3	Preferred	Preferred	Favourable	Preferred	Preferred	Preferred	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>



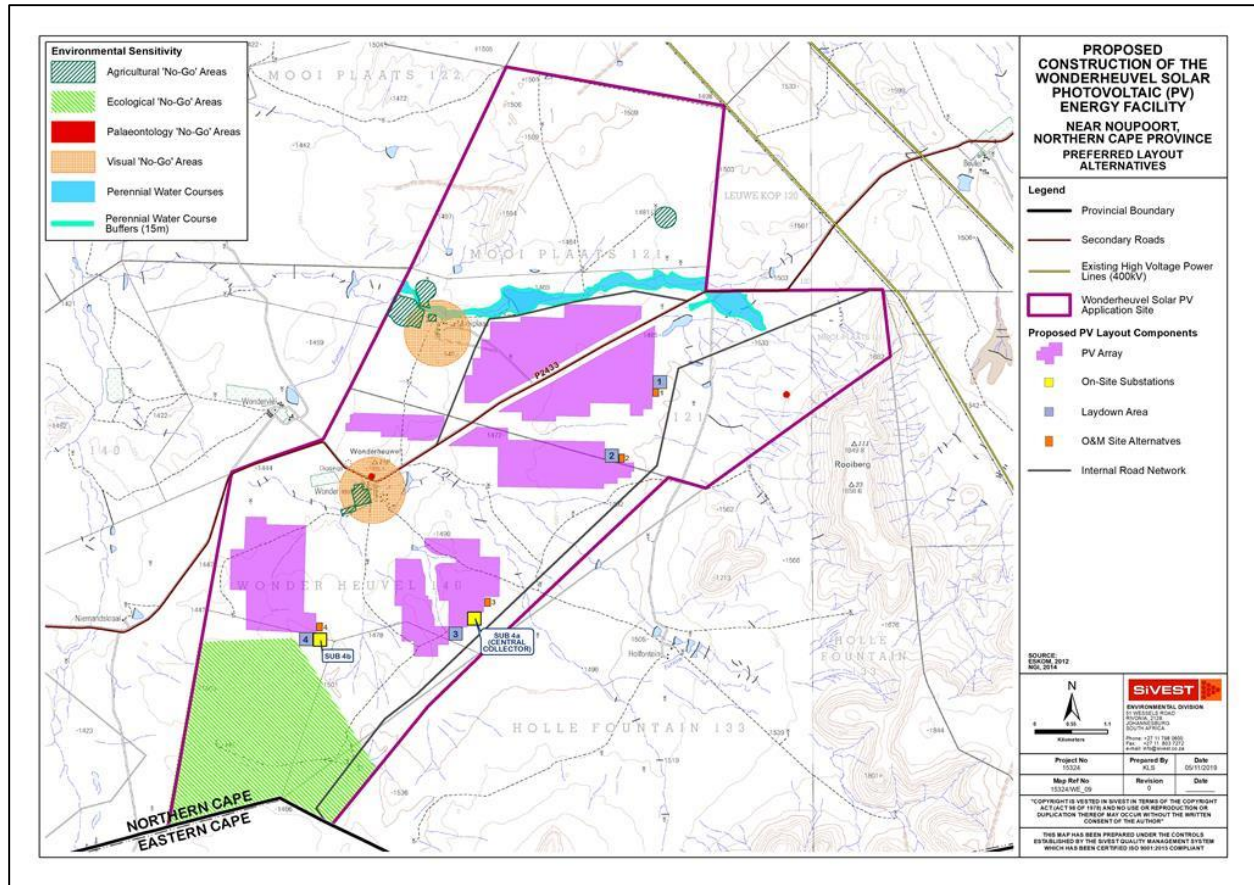
In terms of the grid connection infrastructure alternatives, **Grid Connection Option 3** was found to be the most preferred alternative from an environmental perspective. This is due to the fact that majority of the specialists (namely Terrestrial Ecology, Surface Water, Geotechnical, Avifauna and Social) found this alternative to be 'Preferred'. In addition, this alternative was found to be 'Favourable' from Visual and Heritage perspectives respectively, while the remainder of the specialists found there to be 'No Preference'. Grid Connection Option 1a, 1b, 1c and 1d are considered to be the least preferred alternatives from an environmental perspective as these were found to be 'Not Preferred' from Terrestrial Ecology, Surface Water, Visual, Avifauna and Social perspectives respectively. As such, these alternatives are not deemed to be acceptable grid connection infrastructure alternatives from an environmental perspective. As mentioned, the substation site alternatives are intrinsically linked to the associated electrical infrastructure project alternatives (which include on-site and collector substation sites and 132kV power line corridors) being assessed part of a separate BA process (**DEFF Reference Number: 14/12/16/3/3/1/2134**). The preferences for the grid connection infrastructure alternatives have thus informed the location of the substation sites which are being proposed as part of this EIA application. In light of the above, **Substation 4a (Central Collector) and Substation 4b** are being proposed for authorisation, as these are intrinsically linked to **Grid Connection Option 3** which is preferred from an environmental perspective for the associated electrical infrastructure project. These substation locations align with the preferences for the grid connection alternatives being assessed as part of the associated electrical infrastructure project.

Based on the results of the comparative assessment of alternatives, the following alternatives are preferred:

- **Laydown Area and O&M Building Site Option 1;**
- **Laydown Area and O&M Building Site Option 2;**
- **Laydown Area and O&M Building Site Option 3;**
- **Laydown Area and O&M Building Site Option 4;**
- **Substation 4a (Central Collector Substation); and**
- **Substation 4b (On-site Substation).**

It is requested that the above-mentioned alternatives be authorised by the DEFF<sup>4</sup>. The substation site alternatives (on-site and collector) being proposed as part of this application also align with the preferences for the substation sites associated with the proposed electrical infrastructure project (part of a separate on-going BA process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). It must be noted that the specialist sensitivities and 'no-go' areas informed the location of all alternatives and have been incorporated into the layout design of the preferred site layout (**Figure ix**). In addition, no fatal flaws were identified and therefore all of the alternatives mentioned above are considered to be acceptable, although not necessarily preferable from an environmental perspective.

The preferred site layout in relation to the sensitive areas identified by the specialists is indicated in **Figure ix** below.



**Figure ix: Preferred site layout in relation to identified environmental sensitive areas**

The table below summarises the specialist findings of the scoping phase for the entire proposed development. It should be noted that based on the pre-application meeting held with the DEFF on 19 February 2019, it was confirmed that the specialists could compile one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects as well as the three (3) associated grid infrastructure developments (substations and 132kV power lines), provided the findings and impact assessment sections are project-specific. A copy of the pre-application meeting minutes is provided in **Appendix 9B**.

<p>Terrestrial Ecology</p>	<p>There are various Acts that limit development or require permits before development can proceed. The most important of these are permits required in terms of protected species that could potentially occur on-site, including the National Environmental Management: Biodiversity Act, the Northern Cape Nature Conservation Act and the National Forests Act.</p> <p>Details of the description of the ecological receiving environment are summarised as follows:</p> <ol style="list-style-type: none"> <li>1. The study area is situated in an area that is on the boundary between relatively flat plains and a low mountain range with moderately to steeply sloping</li> </ol>
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	<p>topography. Habitat on-site is in a largely natural state and is in a rural environment. There is very little transformation or serious degradation on site.</p> <ol style="list-style-type: none"> <li>2. There are two (2) regional vegetation types occurring in the project study area, Eastern Upper Karoo (most of the area), and Besemkaree Koppies Shrubland (mountain areas). There are three (3) other national vegetation types in the vicinity, namely Southern Karoo Riviere, Tarkastad Montane Shrubland and Karoo Escarpment Grassland. Floristic components of all five (5) of these units occur in the study area, even though they are not all mapped as occurring within the study area. All these vegetation types are listed in the scientific literature as Least Threatened and none are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).</li> <li>3. All habitat in the Northern Cape part of the study area is mapped as “Critical Biodiversity Area 2” (CBA2) or “Critical Biodiversity Area 1” (CBA1) in the Provincial Conservation Plan and there are also patches mapped as “Ecological Support Area” (ESA). The remaining natural vegetation on-site on the Northern Cape side, therefore, has high value for the conservation of vegetation in the Province according to the broad-scale CBA maps.</li> <li>4. Habitats on-site were divided into five (5) units, namely “Mountain Vegetation”, “Lowland Plains Vegetation”, “Low Ridges and Koppies”, “Broad Drainage Areas” and “Mountain Stream”. The vegetation on the plains on-site was found to be a karroid dwarf shrubland that resembles the description for Eastern Upper Karoo, but the mountain vegetation was a mixed grassy shrubland that appears to be a floristic mix of Besemkaree Koppies Shrubland and Karoo Escarpment Grassland. The mountain vegetation has the highest local diversity and greatest variation in species composition. A map of natural habitats of the study area was produced by mapping from aerial imagery, based on information collected in the field.</li> <li>5. There are no plant species occurring on-site or likely to occur on-site that are protected according to the National Environmental Management: Biodiversity Act (Act No 10. of 2004) (NEM:BA).</li> <li>6. There are a number of plant species occurring on-site that are protected according to the Northern Cape Nature Conservation Act (Act 9 of 2009). It is likely that additional protected species occur there that were not observed during the field survey. None of these are of conservation concern, but a permit is required from the Provincial authorities to destroy them. These are listed in the text in the body of this report.</li> <li>7. There are no protected tree species that are likely to occur in the study area.</li> <li>8. A total of 79 mammal species have a geographical distribution that includes the general study area in which the sites are found. Of the species currently listed as threatened or protected (see Appendix 5 of Terrestrial Ecology Impact Assessment Report for list of protected species), the following are considered to have a very high, high or medium probability of occurring on-site, based on</li> </ol>
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	<p>habitat suitability and evidence collected in the field: the Black-footed Cat (Vulnerable), the Cape Clawless Otter (Near Threatened), the South African Hedgehog (Near Threatened), Grey Rhebok (Near Threatened), White-tailed Rat (Vulnerable), and the Spectacled Dormouse (Near Threatened). There is strong evidence to suggest that the Black-footed Cat and the Cape Clawless Otter both definitely occur on-site.</p> <p>9. The study area contains habitat that is suitable for a small number of frog species. One (1) protected frog species, the Giant Bullfrog, could potentially occur on-site.</p> <p>10. A total of 55 reptile species have a geographical distribution that includes the general study area in which the sites are found. No reptile species of conservation concern could potentially occur in the study area.</p> <p>11. A preliminary sensitivity map of the study area was produced that identifies areas of higher sensitivity that should be taken into account during activities on-site. This includes drainage areas and associated wetland-related habitat, low ridges, parts of the mountain area, and CBA1 and CBA2 areas.</p> <p>The preliminary assessment of impacts indicates that all impacts are of low significance or can be reduced to low significance with mitigation, with the exception of loss of natural vegetation, for which the impact remains of medium significance after mitigation.</p> <p>Proposed mitigation measures include the following: shifting infrastructure positions to avoid sensitive habitats, select infrastructure options that cause the least amount of damage to natural habitats, cross watercourses at right angles, install appropriate structures at watercourse crossings to minimise impacts on these systems, minimise vegetation clearing and disturbance, formalise a rehabilitation programme, undertaking a pre-construction botanical walk-through survey of the footprint of the selected options, obtaining permits for any protected species that may be affected, undertaking a search and rescue of plants for which it is appropriate to rescue, compile an alien plant management plan and undertaking regular monitoring.</p> <p>The report concludes that there are some sensitivities in the study area related to natural habitat and to individual species, but that these can be minimised or avoided with the application of appropriate mitigation or management measures. There will be residual impacts, primarily on natural habitat, but the amount of habitat that will be lost to the project is insignificant compared to the area in hectares of the regional vegetation type that occurs on-site and therefore the residual impacts are considered acceptable, on condition local sensitivities of biodiversity importance are avoided. On this basis, it is recommended that the project be authorised.</p>
Avifauna	The proposed PV facility will have some pre-mitigation impacts on avifauna at a site and local level which will range from Medium to Low.

	<p>The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as Medium. This impact can be partially reversed through mitigation, but it will remain at a Medium level, after mitigation. The envisaged impacts in the operational phase, i.e. mortalities due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low pre-mitigation and could be further reduced with appropriate mitigation. The impact of displacement due to disturbance during the decommissioning phase is rated as Medium, and it will remain at a Medium level after mitigation. The cumulative impact of the proposed PV facilities within a 35km radius is rated as Low, both per- and post-mitigation.</p> <p>The impact of displacement due to disturbance associated with the construction of the proposed substations, is assessed to be Medium and can be mitigated to a Low level. The potential for displacement due to habitat destruction associated with the construction of the substations is rated as Low and could be further reduced with appropriate mitigation. The impact of displacement due to disturbance associated with the decommissioning of the proposed substations is assessed to be Medium and can be mitigated to a Low level.</p> <p><b>IMPACT STATEMENT</b></p> <p>From an avifaunal impact perspective, there is no objection to the proposed development of the PV facility, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase.</p>
Surface Water	<p>Findings were based on the method for delineating wetlands and riparian habitats as per the <b>DWAF (2005 &amp; 2008)</b> guidelines. At a broad level, the study site is located within the Orange Catchment. More specifically, the study area is situated within the quaternary catchments D32B &amp; D32C. The fieldwork assessment found that there are no wetlands on the study site. However, a number of watercourses, both perennial and non-perennial, were identified throughout the entire study area.</p> <p>In terms of the Ecological Condition of the non-perennial, and perennial watercourses, Ecological Condition was assessed to be a class C – Moderately Modified systems.</p> <p>The Environmental Importance and Sensitivity Class for the watercourses was determined. The results showed that the EISC for the watercourses were categorised as a Class B (High). The classification of high EISC was primarily due to the condition of the watercourses assessed, as well as the presence of endangered species.</p>

	<p>The buffer zone determination for the watercourses took into account the type of the proposed development, potential impacts, condition of the habitat as well as other characteristics of the watercourse. As a result, the following buffer zones were assessed and are to be implemented as far as possible:</p> <ul style="list-style-type: none"> <li>▪ Construction Phase Buffer: 15m</li> <li>▪ Operation Phase Buffer: 15m</li> </ul> <p>Foreseen potential negative impacts related to the proposed development were identified and assessed. The potential construction-related impacts included impacts to watercourses (-20 low pre- and -8 low post-mitigation impact rating), hydrology of the watercourses (-20 low pre- and -9 low post-mitigation impact rating) and water quality impacts (-39 medium pre- and -9 low post-mitigation impact rating). The operational impacts identified included impacts to the hydrology of the watercourse (-36 medium pre- and -18 low post-mitigation impact rating). Overall, all impacts were assessed to be low, post-implementation of mitigation measures.</p> <p>In terms of potentially applicable environmental and water-related legislation, listed activities were identified to be triggered in terms of NEMA (1998) and the EIA Regulations (2014, as amended) from a surface water perspective. With respect to the NWA (1998), water uses (c) and (i) were identified as being potentially applicable. However, the application of the risk assessment matrix protocol as per <b>Government Notice 509 of 2016 (No. 40229)</b> was undertaken, the findings show that the risk of potential impacts on the watercourse was assessed to be in the LOW-risk class. Where risks were identified, a number of control measures have been stipulated which will assist in decreasing the level of risk to an even lower level. In accordance with the implementation of control measures, all potential risks are classed as LOW. Therefore, registration for General Authorisation (GA) can be undertaken where required and agreed upon with the Department of Water and Sanitation (DWS).</p> <p>The decision on whether the proposed development is to proceed will rest on environmental and water governmental departments whom will need to make a trade-off between meeting the conservation targets of the province or meeting the energy demands of the country. However, it is the opinion of the specialist that the proposed development may proceed where the relevant control measures and mitigation measures stipulated are implemented.</p> <p>There are a number of recommendations to be implemented for the proposed development. These include the following:</p> <ul style="list-style-type: none"> <li>▪ A stormwater management plan for all phases of the proposed development is required to be compiled and implemented which accounts for control of increased run-off, erosion and sedimentation; and</li> </ul>
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	<ul style="list-style-type: none"> <li>▪ An Alien Eradication and Removal Programme is to be compiled and implemented for the duration of the proposed development.</li> </ul> <p>Based on the findings above, with the implementation of the control and mitigation measures stipulated, it is the opinion of the specialist that the proposed development may proceed.</p>
<p>Agricultural and Soils (Desktop)</p>	<p>It should be noted that a field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development (see section 4.1 of the scoping phase Agricultural and Soils Impact Assessment Report).</p> <p>The key findings of the Agricultural and Soils Impact Assessment are provided below:</p> <ul style="list-style-type: none"> <li>▪ The proposed project area is dominated by shallow, loamy sands on underlying rock or less commonly clay. Dominant soil forms are Swartland, Hutton, Mispah, and Valsrivier.</li> <li>▪ The major limitations to agriculture are the limited climatic moisture availability (low rainfall), the rugged terrain and the shallow, rocky soils.</li> <li>▪ As a result of these limitations, the agricultural use of the study area is limited to low-intensity grazing only, except for some isolated patches of irrigation land.</li> <li>▪ The proposed project area is classified with land capability evaluation values between 1 (very low) and 7 (low to moderate), with 6 being most predominant.</li> <li>▪ The significance of all agricultural impacts is kept low by the limited agricultural potential of the land.</li> <li>▪ The only parts of the study area that do not have low sensitivity are the small patches of irrigation. These are considered no-go areas for any footprint of development that will exclude cultivation.</li> <li>▪ Two (2) potential negative impacts of the development on agricultural resources and productivity were identified. These are: <ul style="list-style-type: none"> <li>○ Loss of agricultural land use; and</li> <li>○ Soil erosion and degradation.</li> </ul> </li> <li>▪ One (1) potential positive impact of the development on agricultural resources and productivity was identified as: <ul style="list-style-type: none"> <li>○ Increased financial security of farming operations through rental income</li> </ul> </li> <li>▪ Soil erosion and degradation was assessed as having medium significance before and after mitigation. The other two (2) impacts were assessed as having low significance before and after mitigation.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ The recommended mitigation measures are for implementation of an effective system of stormwater run-off control; maintenance of vegetation cover; and to strip, stockpile and re-spread topsoil.</li> <li>▪ There is no material difference between the significance of impacts of any of the proposed project alternatives. All proposed alternatives have an equal impact.</li> <li>▪ Due to the low agricultural potential of the site, and the consequent low to medium, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised.</li> </ul>
Visual	<p>Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, solar PV development would alter the visual character and contrast significantly with the typical land-use and/or pattern and form of human elements present across the broader study area. The level of contrast will however be reduced by the presence of the N10 national route and existing high voltage power lines in the northern sector of the study area.</p> <p>The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of twenty-six (26) potentially sensitive receptors were identified in the combined study area, three (3) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from the proposed PV facility. Although the N10 receptor road traverses the study area, motorists travelling along this route are only expected to experience moderate impacts from the proposed Wonderheuvvel solar PV facility.</p> <p>An overall impact rating was also conducted in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed Wonderheuvvel solar PV facility would be of low significance during both construction and decommissioning phases.</p> <p>During operation, visual impacts from the solar PV facility would be of medium significance with relatively few mitigation measures available to reduce the visual impact.</p> <p>Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the Wonderheuvvel solar PV project, it was determined that only one (1) of these would have any significant impact on the landscape within the visual assessment zone, namely</p>



	<p>Umsobomvu WEF. This proposed WEF, in conjunction with the proposed solar PV facility, will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, paroral landscape, thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.</p> <p>No fatal flaws were identified for any of the proposed site alternatives for laydown areas and O&amp;M buildings. A summary of the preference rating is provided below:</p> <ul style="list-style-type: none"> <li>▪ Wonderheuvl Solar PV Facility: No preference was determined for any of the laydown area and O&amp;M building site options and all but two (2) sites were found to be favourable. The remaining options, Site Option 6 and Site Option 8 were found to be the least preferred due to their proximity to potentially sensitive receptors.</li> </ul> <p>It is the specialist's opinion that the visual impacts associated with the proposed Wonderheuvl solar PV facility are of moderate significance. Given the low level of human habitation and the relative absence of sensitive receptors, the project is deemed acceptable from a visual perspective and the EA should be granted for the relevant EIA application. The specialist is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.</p>
Heritage (Desktop)	<p>The Heritage Impact Assessment (HIA) consisted of a scoping phase during which background information and landscape analysis was done to determine the heritage resources that can potentially occur within the study area. This was followed up with fieldwork by a team of archaeologist and a palaeontologist with the aim of identifying heritage resources in the development footprint areas and to make recommendations on the management of these resources and the possible chance finds during construction activities.</p> <p>The field work identified a total of ten (10) areas of heritage significance. Adjustments to the project layouts based on the various specialist input resulted in the total avoidance of three (3) heritage areas that was excluded from the reporting. The remaining seven (7) sites consist of three (3) large, low to medium density scatters of later stone age sites (UMS005,008 and 009). UMS004, 006 and 007 are all- round stone packed enclosure.</p>

	<p>UMS010 was identified as a fossil find spot and a 50-meter buffer around the fossil bearing material must be implemented. Any construction in the demarcated area must be monitored by a palaeontologist.</p> <p>The impact rating on the heritage resources indicated that pre-mitigation a negative high impact is projected but with the implementation of the recommended management measures this impact rating will be reduced to low negative.</p> <p>The results of the comparative assessment of the alternatives provided found there to be no preference between the layout alternatives. This is due to the fact that no heritage issues were identified for any of the footprints. The palaeontological sensitive area at UMS010 is the only heritage resources that influences the Options assessment, but those options affected is still favourable with the implementation of the recommended management measures.</p> <p>It is the specialist's considered opinion, based on the current data available, that with the consideration of the position of heritage sensitivities during the layout design and the implementation of the proposed management measures, the project will have an acceptable low impact on heritage resources and can continue.</p>
Palaeontology	<p>The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a Palaeontological Impact Assessment (PIA) is key to detect the presence of fossil material within the planned development footprint. This PIA is thus necessary to evaluate the effect of the construction on the palaeontological resources.</p> <p>These proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction. According to the PalaeoMap of South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Tarkastad and Adelaide Subgroups has a Very High Palaeontological Sensitivity, while that of the Quaternary superficial deposits of the Central interior is high and the Karoo dolerite (igneous rocks) is insignificant and rated as zero.</p> <p>A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24<sup>th</sup> – 28<sup>th</sup> January 2019. Elsewhere in the Karoo Basin numerous fossils have been uncovered in these geological sediments but only two (2) sites on koppies with fossiliferous outcrops were identified. Although these</p>

	<p>localities do not currently fall in the proposed development sites, these fossiliferous sites have been identified as Highly Sensitive and No-go areas. It is recommended that a 50m buffer will be placed around these areas. If construction is a necessity in these sensitive areas, it is recommended that the fossils will be collected by a professional palaeontologist. Preceding excavation of any fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.</p> <p>With the above-mentioned in consideration, the proposed development, as well as all alternatives have a similar geology and therefore there is no preferences on the grounds of palaeontological fossil heritage for any specific layout among the different options under consideration. As impacts on fossil heritage usually only occur during the excavation phase, no further impacts on fossil heritage are expected during the operation and decommissioning phases of the Solar Energy Facility (SEF).</p> <p>The impact of development on fossil heritage are usually negative but it could also have a positive impact due to the discovery of newly uncovered fossil material that would have been unavailable for scientific research. The SEF could also provide a long-term benefit to the country by supplying renewable energy to the electricity grid.</p> <p>In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, in situ) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation (e.g. recording and collection) can be carried out by a palaeontologist.</p> <p>It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. From a Palaeontological Heritage view there is no fatal flaws in the proposed SEF development project. However, it is recommended that the mitigation measures are included in the Environmental Management Programme (EMPr) and fully implemented.</p>
Social	<p><b><u>APPROACH TO STUDY</u></b></p> <p>Data was gathered using the following techniques.</p> <p><b>Collection of data</b></p> <p>Data was gathered through:</p>

- The project description prepared by the project proponent.
- Statistics South Africa, Census 2011 and other relevant demographic data generated by Stats SA such as the Quarterly Labour Force Survey and Mid-year population estimates.
- Discussions with the project proponents and Environmental Impact Assessment Consultants.
- A literature review of various documents such as the relevant Municipal Integrated Development Plans (IDPs) and other specialist reports and documents.
- A broader literature scan.

**Impact assessment technique**

The assessment technique used to evaluate the social impacts was provided by SiVEST Environmental Division and is attached in Appendix 1 of the Social Impact Assessment Report (**Appendix 6F**).

**IMPACTS IDENTIFIED**

The impacts are assessed in respect of the following phases of the project:

- Planning and design
- Construction
- Operational
- Decommissioning, and
- The ‘no go’ option.

**Construction phase**

Most of the impacts discussed above apply over the short-term to the construction phase of the project and include:

- Annoyance, dust and noise;
- Increase in crime;
- Increased risk of HIV infections;
- Influx of construction workers and job seekers;
- Hazard exposure;
- Disruption of daily living patterns;
- Disruptions to social and community infrastructure;
- Job creation and skills development; and
- Socio-economic stimulation.

**Operational phase**

The social impacts that apply to the operational phase of the project are:

- Transformation of the sense of place; and
- Economic.
  - Job creation and skills development.

- Socio-economic stimulation.

### **Decommissioning**

If the project were to be completely decommissioned the major social impacts likely to be associated with this would be the loss of jobs and revenue stream that stimulated the local economy and flowed into the municipal coffers.

### **'No Go' Alternative**

The 'no go' option would mean that the social environment is not affected as the status quo would remain. On a negative front it would also mean that all the positive aspects associated with the project would not materialise. Considering that Eskom's coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not at a global level.

### **Cumulative Impacts**

In this regard the following cumulative impacts are addressed below:

- Risk of HIV
- Sense of place
- Service supplies and infrastructure, and
- The economic benefit.

No fatal flaws associated with the cumulative impacts are evident at a social level. The findings support the recommendations of the various reports undertaken for the different renewable energy projects in the region that, on an overall basis, the social benefits of renewable energy projects outweigh the negative benefits and that the negative social impacts can be mitigated.

### **COMPARATIVE ASSESSMENT OF LAYOUT ALTERNATIVES**

As no social preference emerged in respect of any of the alternatives, the other specialist reports were perused to establish if there was any preference that would have an influence on the social. Based on this analysis the following preferences were identified and supported on a social basis:

- Laydown Area and O&M Building Site Option 1 = Preferred
- Laydown Area and O&M Building Site Option 2 = Preferred
- Laydown Area and O&M Building Site Option 3 = Preferred
- Laydown Area and O&M Building Site Option 4 = Preferred
- Laydown Area and O&M Building Site Option 5 = Least Preferred
- Laydown Area and O&M Building Site Option 6 = Least Preferred
- Laydown Area and O&M Building Site Option 7 = Least Preferred
- Laydown Area and O&M Building Site Option 8 = Least Preferred

## **CONCLUSION AND RECOMMENDATIONS**

In assessing the social impact of the solar PV Facility, it was found that in respect of the energy needs of the country and South Africa's need to reduce its carbon emissions that the project fits with national, provincial and municipal policy.

Regarding the social impacts associated with the project it was found that most apply over the short term to the construction phase of the project. Of these impacts all can be mitigated to within acceptable ranges and there are no fatal flaws associated with the construction or operation of the project.

On a cumulative basis it is evident that the cumulative impacts associated with changes to the social environment of the region are more significant than those attached to the project in isolation. On a negative front there are two (2) issues associated with developments in the region that are of most concern. The first of these issues is the change to the sense of place of an area that was once considered a pristine region of South Africa. The second is the potential, through an influx of labour and an increase in transportation to construction sites, of the risk for the prevalence of HIV to rise in an area that has a relatively low HIV prevalence rate. In this regard it is important that the relevant authorities recognise these issues and find ways of mitigating them to ensure that they do not undermine the benefit that renewable energy projects bring, both to the region as well as to the country as a whole. These issues are beyond a project-specific basis and as such will need to be addressed at a higher level.

### **Impact Statement**

The project site and surrounding areas are sparsely populated with the agricultural potential of the area being low. Accordingly, the negative social impacts associated with the proposed Wonderheuveld solar PV facility are of low to moderate significance with most occurring over the short term construction phase. The project has a positive element which outweighs the negative in that it will contribute towards the supply of renewable energy into a grid system heavily reliant on coal-powered energy generation. In this sense the project forms part of a national effort to reduce South Africa's carbon emissions and thus carries with it a significant social benefit and is thus supported and should proceed.

As the area is sparsely populated and the negative social impacts associated with the solar PV facility is of moderate significance, it is most unlikely that any further social study will be necessary. This will, however, be dependent on the outcome of the public participation process which may result in a need to update the current report by incorporating the comments recorded and updating the social impacts accordingly.

<p>Geotechnical (Desktop)</p>	<p>The desktop geotechnical assessment did not identify any fatal flaws that, from a geological and geotechnical perspective, would prevent the construction of the proposed Wonderheuvvel Solar PV Energy Facility.</p> <p>The potential impacts the project may have on the geology, relate to soils that could be impacted by the construction activities. There may be a potential for soil erosion, due to removal of vegetation and exposure of the soils to the elements, during construction. The impacts were found to be of “<b>negative low impact</b>”.</p> <p>Various options were studied for the PV facility. The geological impacts will be similar. Due the very similar bedrock geology, similar geotechnical conditions are expected across all options.</p> <p>From a geological and geotechnical perspective, based on the minimal negative impacts on the geology and soils and the recommendations for mitigation measures, it is recommended that the project receives the ‘go-ahead’ from the Competent Authority.</p>
<p>Transportation</p>	<p>The following conclusions were made:</p> <ul style="list-style-type: none"> <li>▪ During the construction phase an additional ±43 vehicles trips will commute at the peak of the construction phase, transporting staff and labour. Typically, these trips will be in the morning between 6:00 – 7:00 and in the afternoons between 16:00 – 17:00.</li> <li>▪ The heavy construction vehicles and deliveries will contribute an additional ±25 vehicle trips / day, typically occurring during the ‘weekday midday’ which will equate to ±4 vehicle trips / hour. These additional vehicles will only contribute a small percentage to the existing road network.</li> <li>▪ The abnormal loads on this development will be negligible and therefore will have no major impact.</li> <li>▪ The cumulative impact of the area confirms that no significance rating change will be experienced during the construction period of the PV development.</li> <li>▪ The existing road network can accommodate the proposed development; however, the recommendations below must be considered to mitigate any possible negative impacts.</li> <li>▪ We recommend a Traffic Management Plan be completed prior to construction in order to form part of the Final Environmental Management Programme (EMPr). The plan must include inter alia the following; <ul style="list-style-type: none"> <li>○ The review of all intersections and routes prior to the project commencing in order to accommodate construction vehicles and staff commuting.</li> <li>○ Further discussions with the SANRAL and the respective transport department on access points and route requirements.</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>○ The upgrades of intersections and the installation of road traffic signage as per the SARTSM (South African Road Traffic Sign Manual).</li> <li>○ The implementation of pedestrian safety initiatives</li> <li>○ The implementation of a road maintenance plan under the auspices of the respective transport department.</li> </ul> <ul style="list-style-type: none"> <li>▪ We recommended that one (1) access point from the N10 freeway be used for the proposed facility to reduce the impact to the area. This access point is located at Km19.92 on section N10-5 and the appropriate axillary lanes and speed reduction measures are to be implemented subsequent to discussions with SANRAL. This study and a revised study, with the all the renewable parties involved in the area at the time, must be submitted to SANRAL and more specifically Ms. Colene Runkel (021 957 4613) for review and comments.</li> <li>▪ Development of access points to the PV facility is as per the recommendations in section 9 of the specialist Transportation Report (<b>Appendix 6I</b>).</li> <li>▪ The appropriate load permits be obtained from the Department of Transport prior to construction (if required).</li> <li>▪ This assessment is limited to the impacts the development traffic will have on the network and not on the wider impacts known as background traffic. Background traffic includes the cumulative impacts other developments will have on the environment if their programs overlap. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods. We therefore recommend that this study be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.</li> </ul>
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These specialist studies were conducted to address the potential impacts relating to the proposed development. An impact assessment was conducted to ascertain the level of each identified impact, as well as mitigation measures which may be required. The potential positive and negative impacts associated with these studies have been evaluated and rated accordingly. In addition, as mentioned, the scoping phase specialist assessments were updated / revised to focus on specific impacts of the proposed PV array / development areas and solar PV energy facility infrastructure in detail. Layout alternatives have also been investigated and comparatively assessed (**section 8**).

The results of the specialist studies have indicated that the preferred options contain no fatal flaws. In addition, all applicable environmental aspects were thoroughly investigated as part the EIA process and the specialists did not recommend any further studies and/or investigations to be undertaken. However, from a transportation perspective it was recommended that a detailed Traffic Impact Study, which takes into account actual traffic counts undertaken during the peak periods, be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.

It should be noted that the application for EA and DSR were received by the DEFF on 26 July 2019, and the following reference number was allocated for the proposed development: 14/12/16/3/3/2/1135. In addition, the DSR was circulated for public participation for a period of 30 days (excluding public holidays) from Friday 26 July 2019 until Monday 26 August 2019. Hard copies of the DSR were made available at a public venue (namely the Noupoot Public Library) and an electronic copy was also made available on SiVEST's website (see **section 8.7**). All Interested and/or Affected Parties (I&APs) and key stakeholders, such as Organs of State (OoS) / authorities, who are registered on the project database were notified of the submission of the DSR and the above-mentioned 30-day public review and comment period accordingly. In addition, all OoS / authorities were sent electronic copies (on CD) of the DSR. The 30-day public review and comment period was provided for the general public and for the I&APs and key stakeholders, as required by the EIA Regulations, 2014 (as amended). The DSR was thereafter updated and the FSR was submitted to the DEFF on Friday 06 September 2019. All I&APs and key stakeholders who are registered on the project database were notified of the submission of the FSR. After evaluating the FSR the DEFF issued a letter, dated 08 October 2019, indicating that the documents complied with the minimum requirements of the EIA Regulations, 2014 (as amended), and that SiVEST could proceed with the EIA process [i.e. Draft Environmental Impact Assessment Report (DEIAR) and FEIAR].

The DEIAR was subsequently circulated for public participation for a period of 30 days (excluding public holidays), from Friday 22 November 2019 until Monday 13 January 2020. Hard copies of the DEIAR were made available at a public venue (namely the Noupoot Public Library) and an electronic copy was also made available on SiVEST's website. All I&APs and key stakeholders, such as OoS / authorities, which are registered on the project database were notified of the submission of the DEIAR and the above-mentioned 30-day public review and comment period accordingly. In addition, all OoS / authorities were sent electronic copies (on CD) of the DEIAR. It should be noted that two (2) meetings were undertaken during the DEIAR review and comment period, namely one (1) Public Meeting and one (1) Focus Group Meeting (FGM). Invitations to these meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&APs and key stakeholders (including affected and adjacent landowners) on the project database. Additionally, Ward Councilors were utilised in order to distribute / share information with members of the affected communities. Members of the affected communities are encouraged to contact SiVEST in order to register as an I&AP on the project database and to obtain project information and/or notifications (**section 9.9**). All comments received to date have been responded to in the C&RR (**Appendix 7E**). Comments received on the DEIAR were taken into consideration, incorporated into the report (where possible) and will be used when compiling this FEIAR. The FEIAR was submitted to the DEFF for decision-making on Tuesday the 13<sup>th</sup> of February 2020. Once the DEFF have acknowledged receipt of the FEIAR, the DEFF will have 107 days to either grant or refuse the EA for the proposed development.

It is the opinion of the EAP that the information and data provided in this FEIAR is sufficient to enable the DEFF to consider all identified potentially significant impacts and to make an informed decision on the application. Furthermore, it is the opinion of the EAP that based on the findings of the EIA that the proposed development should be granted an EA and allowed to proceed, provided the following conditions are adhered to:

- All feasible and practical mitigation measures recommended by the various specialists must be incorporated into the Final Environmental Management Programme (EMPr) and implemented; and
- Where applicable, monitoring should be undertaken to evaluate the success of the mitigation measures recommended by the various specialists.

SiVEST, as the EAP, is therefore of the view that:

- Preferred Laydown Area, O&M Building and Substation sites (on-site and collector) have been identified which are less environmentally sensitive compared to the other site considered during the EIA phase; and
- Through the implementation of mitigation measures, together with adequate compliance monitoring, auditing and enforcement thereof by the appointed Environmental Control Officer (ECO) as well as the competent authority, the potential detrimental impacts associated with the proposed development can be mitigated to acceptable levels.

The date on which the activity will commence cannot be determined at this stage as they are based on the timeframes dictated by the REIPPPP bid windows. The date of the next round of bid submissions has not yet been announced. The construction of the Wonderheuvvel Solar PV Energy Facility and associated infrastructure is dependent on being selected as a preferred bidder or entering into an offtake agreement with a different energy consumer. The project will therefore require an environmental authorisation of at least ten (10) years.

It is trusted that the FEIAr provides adequate information to the I&APs to provide input and for the competent authority to make an informed decision regarding the proposed development.

### **Way forward**

The proposed development is in the final stages of the EIA Phase and the FEIAr was submitted to the DEFF for decision-making on Tuesday the 13<sup>th</sup> of February 2020. Once the DEFF have acknowledged receipt of the FEIAr, the DEFF will have 107 days to either grant or refuse the EA for the proposed development. In addition, once a decision regarding the EA has been received from the DEFF, it will be made available to the public and all registered I&APs, stakeholders and OoS / authorities will be notified accordingly and provided details regarding the appeal process. The EIA process will thus come to an end once appeals (if any) have been dealt with adequately and the appeal process closes.

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## Glossary of Terms

**Alluvial:** Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

**Archaeological resources:** This includes:

- i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- iii. wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

**Biodiversity:** The diversity of genes, species and ecosystems, and the ecological and evolutionary processes that maintain that diversity.

**Cultural landscape:** A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992).

**Cultural Significance:** This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

**Cumulative Impact:** In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

**Endemic:** Restricted or exclusive to a particular geographic area and occurring nowhere else. Endemism refers to the occurrence of endemic species.

**Environmental Impact Assessment:** In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

**Environmental Impact Report:** In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

**Environmental Management Programme:** A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

**"Equator Principles":** A financial industry benchmark for determining, assessing and managing social & environmental risk in project financing.

**Fossil:** Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

**Habitat:** The area of an environment occupied by a species or group of species, due to the particular set of environmental conditions that prevail there.

**Heritage:** That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

**Heritage Resources:** This means any place or object of cultural significance, such as the caves with archaeological deposits identified close to both development sites for this study.

**Kilovolt (kV):** a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

**Mitigate:** The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

**"No-Go" option:** The "no-go" development alternative option assumes the site remains in its current state, i.e. there is no construction of a solar PV energy facility and associated infrastructure in the proposed project area.

**Palaeontology:** Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

**Precipitation:** Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

**PV Development Area:** Area for the potential erection of PV panels within the application site

**Red Data Species:** All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

**Red List:** A publication that provides information on the conservation and threat status of species, based on scientific conservation assessments.



**Rehabilitation:** Less than full restoration of an ecosystem to its pre-disturbance condition.

**Restoration:** To return a site to an approximation of its condition before alteration.

**Riparian:** The area of land adjacent to a river or stream that is, at least periodically, influenced by flooding.

**Scenic route:** A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

**Scoping Report:** An “issues-based” report which forms the first phase of an Environmental Impact Assessment process.

**Sense of place:** The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

**Species of Special / Conservation Concern:** Species that have particular ecological, economic or cultural significance, including but not limited to threatened species.

**Threatened Ecosystems:** An ecosystem that has been classified as Critically Endangered, Endangered or Vulnerable, based on analysis of ecosystem threat status. A threatened ecosystem has lost, or is losing, vital aspects of its structure, composition or function. The Biodiversity Act makes provision for the Minister or Environmental Affairs, or a provincial MEC of Environmental Affairs, to publish a list of threatened ecosystems.

**Threatened Species:** A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.

**Visual Assessment Zone:** The visual assessment zone or study area is assumed to encompass a zone of 10km from the outer boundary of the proposed application site.

## List of Abbreviations

AAA	- Astronomy Advantage Area
AC	- Alternating Current
AP	- Action Plan
APM	- Archaeology, Palaeontology and Meteorites
ATNS	- Air Traffic and Navigation Services Company Limited
AIA	- Archaeological Impact Assessment
BA	- Basic Assessment
BID	- Background Information Document
BLSA	- BirdLife South Africa
BRICS	- Brazil, Russia, India, China and South Africa
CAA	- Civil Aviation Act (Act No. 13 of 2009)
CARA	- Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	- Critical Biodiversity Area
CBD	- Convention on Biodiversity
CR	- Critically Endangered
CV	- Curriculum Vitae
DC	- Direct Current
DEFF	- Department of Environment, Forestry and Fisheries
DEIAr	- Draft Environmental Impact Assessment Report
DDD	- Data Deficient: well known but not enough information for assessment
DDT	- Data Deficient: taxonomic problems
DDX	- Data Deficient: unknown species
DM	- District Municipality
DSR	- Draft Scoping Report
DoE	- Department of Energy
DM	- District Municipality
DNI	- Direct Normal Irradiation
DWS	- Department of Water and Sanitation
EAP	- Environmental Assessment Practitioner
ECA	- Environmental Conservation Act (ECA) (Act No. 73 of 1989)
ECPC	- Eastern Cape Planning Commission
ECO	- Environmental Control Officer
ED	- Economic Development
EHS	- Environmental, Health, and Safety
EIA	- Environmental Impact Assessment
EIAr	- Environmental Impact Assessment Report
EIR	- Environmental Impact Report
EISC	- Ecological Importance and Sensitivity Categorisation
EMPr	- Environmental Management Programme
EMI	- Electromagnetic Interference
EN	- Endangered
ENPAT	- Environmental Potential Atlas
EP	- Equator Principles

EPC	- Engineering, Procurement and Construction
ERA	- The Electricity Regulation Act No. 4 of 2006
ESA	- Ecological Support Area
ESA	- Early Stone Age
ESMP	- Environmental and Social Management Plan
ESMS	- Environmental and Social Management System
EX	- Extinct
FEIAr	- Final Environmental Impact Assessment Report
FSR	- Final Scoping Report
GA	- General Authorisation
GDP	- Gross Domestic Product
GHG	- Green House Gases
GHI	- Global Horizontal Irradiation
GIS	- Geographic Information System
GUMP	- Gas Utilisation Master Plan
GW	- Gigawatts
GWh	- Gigawatt Hours
HIA	- Heritage Impact Assessment
I&AP(s)	- Interested and/or Affected Party/Parties
IBA(s)	- Important Bird Area(s)
IDP	- Integrated Development Plan
IEP	- Integrated Energy Plan
IFC	- International Finance Corporation
IKA	- Index of Kilometric Abundance
IPP(s)	- Independent Power Producers
IRP	- Integrated Resource Plan
IUCN	- International Union for the Conservation of Nature and Natural Resources
kV	- Kilo Volt
LM	- Local Municipality
LED	- Local Economic Development
LSA	- Late Stone Age
MSA	- Middle Stone Age
MSL	- Mean Sea Level
Mtoe	- Millions of Tonnes of Oil Equivalent
MW	- Megawatt
NC DENC	- Northern Cape Department of Environment and Nature Conservation
NC PGDS	- Northern Cape Provincial Growth and Development Strategy
NEA	- The National Energy Act (Act No. 34 of 2008)
NEMA	- National Environmental Management Act No. 107 of 1998
NEM:AQA	- National Environmental Management: Air Quality Act (Act No. of 2004)
NEM:BA	- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM:PAA	- National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NFA	- The National Forest Act (Act No. 84 of 1998)
NFEPA	- National Freshwater Ecosystem Priority Areas
NHRA	- National Heritage Resources Act (Act No. 25 of 1999)

NPAES	- National Parks Area Expansion Strategy
NRTA	- National Road Traffic Act (Act No. 93 of 1996)
NT	- Near Threatened
NWA	- National Water Act (Act No. 36 of 1998)
OHSA	- Occupational Health and Safety Act (Act No. 85 of 1993)
PDP	- Provincial Development Plan
PES	- Present Ecological Status
PIA	- Palaeontological Impact Assessment
PoS	- Plan of Study
PM	- Public Meeting
PPA	- Power Purchase Agreement
PPP	- Public Participation Process
PV	- Photovoltaic
RDP	- Rural Development Plan
REDZ	- Renewable Energy Development Zone
REIPPPP	- Renewable Energy Independent Power Producer Procurement Programme
RE	- Renewable Energy
SA	- South Africa
SACAA	- South African Civil Aviation Authority
SAHRA	- South African Heritage Resources Agency
SAHRIS	- South African Heritage Resources Information System
SALA	- Subdivision of Agricultural Land Act (Act No. 70 of 1970)
SANBI	- South African National Biodiversity Institute
SARADA	- South African Rock Art Digital Archive
SDF	- Spatial Development Framework
SEF	- Solar Energy Facility
SPVs	- Special Purpose Vehicles
TL	- Terrain Loss
VEGRAI	- Vegetation Response Assessment Index
VIA	- Visual Impact Assessment
VU	- Vulnerable
WETFEPAs	- Wetland Freshwater Priority Areas
WEF	- Wind Energy Facility
WMA	- Water Management Area
WUL	- Water Use License
WULA	- Water Use License Application
WWF	- World Wildlife Fund

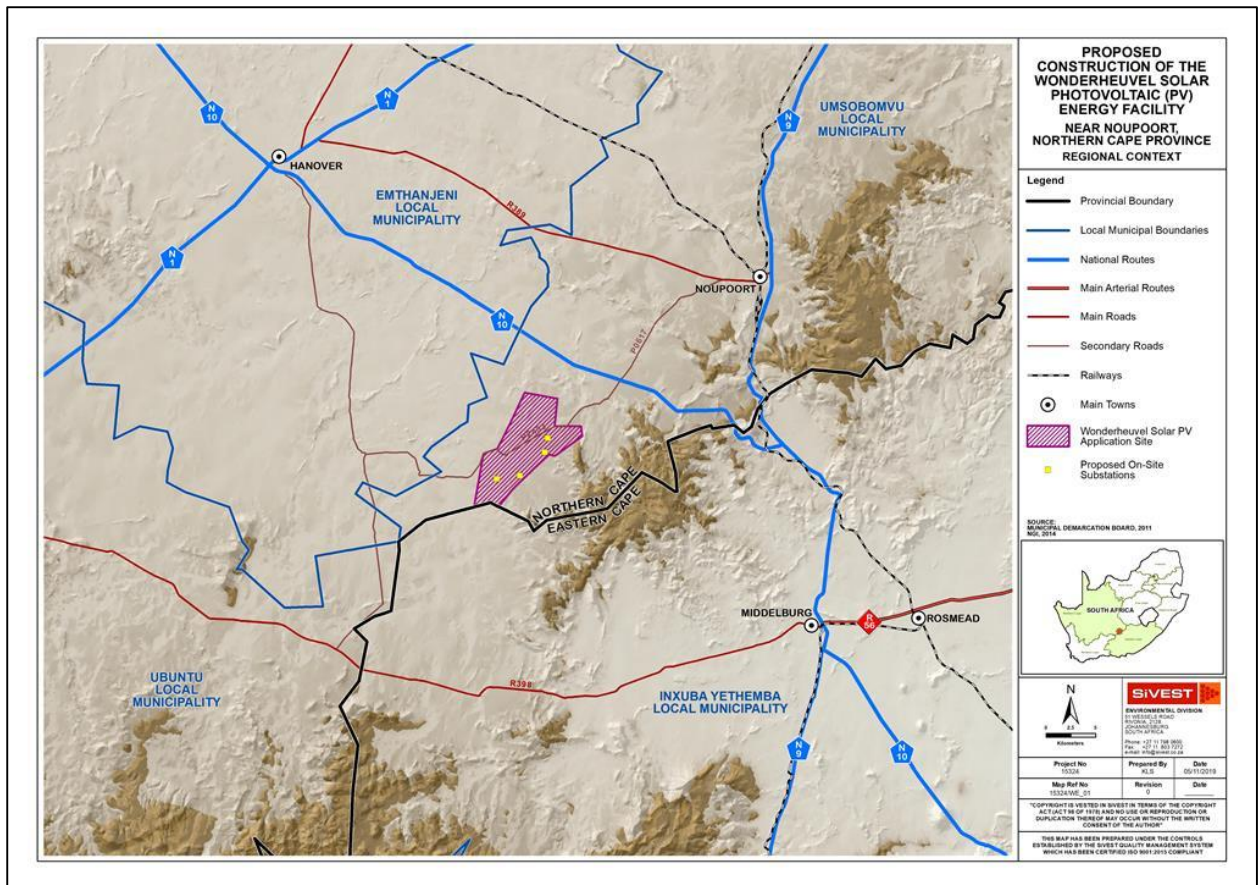
# 1 INTRODUCTION

Wonderheuvel Solar Power (Pty) Ltd (hereafter referred to as Wonderheuvel Solar Power) is proposing to construct the Wonderheuvel Solar Photovoltaic (PV) Energy Facility and associated infrastructure (hereafter referred to as the 'proposed development') near Noupoort in the Umsobomvu Local Municipality, which falls within the Pixley ka Seme District Municipality in the Northern Cape Province of South Africa (**Figure 2**) (**DEFF Reference Number: 14/12/16/3/3/2/1135**). It should be noted that the proposed development will have a maximum generation capacity of up to approximately 480MW. SiVEST Environmental Division has subsequently been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process for the proposed construction of the Wonderheuvel Solar PV Energy Facility and associated infrastructure. The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid.

The above-mentioned proposed solar PV energy facility forms one (1) of three (3) solar PV energy facilities that are being proposed on adjacent farms as part of the greater Umsobomvu PV project (**Figure 1**). The other proposed developments which form part of the greater Umsobomvu PV project include the following:

- Mooi Plaats Solar PV – **DEFF Reference Number: 14/12/16/3/3/2/1134** (part of a separate on-going EIA process); and
- Paarde Valley Solar PV – **DEFF Reference Number: 14/12/16/3/3/2/1136** (part of a separate on-going EIA process).

In addition, a 132kV overhead power line and 33/132kV on-site and collector substations (namely the associated electrical infrastructure) are also being proposed to feed the electricity generated by the proposed Wonderheuvel Solar PV Energy Facility into the national grid. The associated electrical infrastructure will however require a separate Environmental Authorisation (EA) and is subject to a separate Basic Assessment (BA) process (**DEFF Reference Number: 14/12/16/3/3/1/2134**). The associated electrical infrastructure has been included in the solar PV energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The on-site and collector substations will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substations have been included in the solar PV energy facility EIA and in the associated electrical infrastructure BA to allow for handover to Eskom. Although the solar PV energy facility and associated electrical infrastructure will be assessed separately, a single public participation process is being undertaken for all the proposed developments [i.e. three (3) solar PV energy facility EIAs and three (3) grid connection BAs]. The potential environmental impacts associated with all of the developments will be assessed as part of the cumulative impact assessment.



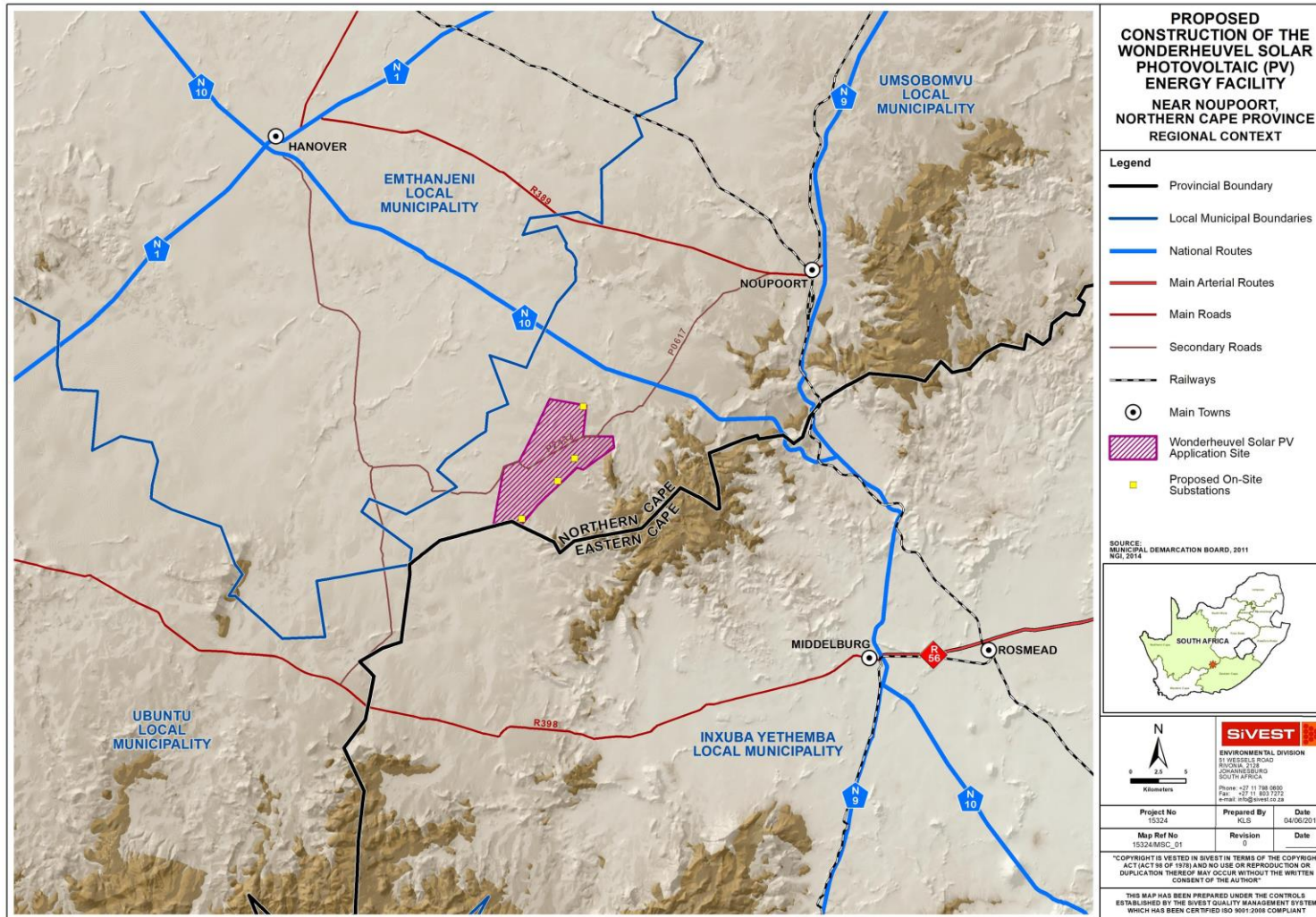
**Figure 1:** Regional context of greater Umsobomvu PV project

Due to the fact that the proposed development is not located within any of the Renewable Energy Development Zones (REDZs) formally gazetted<sup>8</sup> in South Africa for the purpose of development of solar and wind energy generation facilities, the Wonderheuveld Solar PV Energy Facility was subject to a full EIA process in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, and the EIA Regulations 2014 (as amended in 2017).

The proposed development requires an EA from the National Department of Environment, Forestry and Fisheries (DEFF). However, the provincial authority was also being consulted (i.e. the Northern Cape Department of Environment and Nature Conservation - NC DENC). The EIA for the proposed development was conducted in terms of the EIA Regulations, 2014 (as amended) promulgated in terms of Chapter 5 of the NEMA. In terms of these regulations, a full EIA process was required for the proposed development. All relevant legislation and guidelines (including Equator Principles) were consulted during the EIA process and were complied with at all times.

<sup>8</sup> Formally gazetted on 16 February 2018 (government notices 113 and 114)





**Figure 2:** Wonderheuveld Solar PV Energy Facility in the regional context.



## 1.1 Objectives of the EIA Process

Appendix 3 of the NEMA EIA Regulations, 2014 (as amended), state that the objective of the EIA Process is to:

- (i) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- (ii) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report;
- (iii) identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- (iv) determine the –
  - (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - (ii) degree to which these impacts –
    - (aa) can be reversed;
    - (bb) may cause irreplaceable loss of resources, and
    - (cc) can be avoided, managed or mitigated;
- (v) identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;
- (vi) identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;
- (vii) identify suitable measures to avoid, manage or mitigate identified impacts; and
- (viii) identify residual risks that need to be managed and monitored.

An Environmental Impact Assessment Report (EIAR) must contain the information that is necessary for the competent authority to consider and come to a decision on the application. The content requirements for an EIAR (as provided in Appendix 3 of the EIA Regulations 2014, as amended), as well as details of which section of the report fulfils these requirements, are shown in **Table 1** below.

**Table 1:** Content requirements for an EIA Report

Content Requirements	Applicable Section
(a) details of- <ul style="list-style-type: none"> <li>(i) the EAP who prepared the report; and</li> <li>(ii) the expertise of the EAP, including a curriculum vitae (CV);</li> </ul>	Details of the EAP and full project team are included in <b>section 1.4</b> . The expertise (including curriculum vitae) of the EAP and full project team are included in <b>Appendix 2</b> .
(b) the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including-	The location (including 21-digit Surveyor General codes) of the proposed project is detailed on <b>page</b>

Content Requirements	Applicable Section
<p>(i) the 21-digit Surveyor General code of each cadastral land parcel;</p> <p>(ii) where available, the physical address and farm name;</p> <p>(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;</p>	<p><i>iii</i> of the report, as well as in <b>section 3.1</b> and <b>section 6.2</b> respectively. Coordinates (corner points, bend points and centre points) of the application site and PV array areas are provided on <b>page iii</b> of the report, as well as in <b>Appendix 9A</b>.</p>
<p>(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-</p> <p>(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or</p> <p>(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;</p>	<p>A map of the regional locality is shown in <b>section 1</b> and <b>section 6.1</b> respectively, and the site locality is shown in <b>section 6.2</b>. Additionally, all project maps are included in <b>Appendix 5</b>. Coordinates are provided on <b>page iii</b> of the report, as well as in <b>section 6.2</b>. Additionally, all coordinates are included in <b>Appendix 9A</b>.</p>
<p>(d) a description of the scope of the proposed activity, including-</p> <p>(i) all listed and specified activities triggered;</p> <p>(ii) a description of the associated structures and infrastructure related to the development;</p>	<p>The listed and specified activities triggered as per NEMA are detailed in <b>section 4.1.3</b>. The technical project description is included in <b>section 3</b>. This includes a description of activities to be undertaken, including associated structures and infrastructure.</p>
<p>(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;</p>	<p>A description of all legal requirements and guidelines is provided in <b>section 4</b>. This includes key legal and administrative requirements as well as key development strategies and guidelines.</p>
<p>(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 development footprint within the approved site as contemplated in the accepted scoping report;</p>	<p>The need and desirability of the proposed project is discussed in <b>section 5</b>.</p>
<p>(g) motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;</p>	<p>The motivation for the preferred development footprint of the proposed project is discussed in <b>section 8</b>.</p>
<p>(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:</p>	<p>A description of the alternatives considered in terms of the Regulations is included in <b>section 3.3</b>. An assessment of layout</p>

Content Requirements	Applicable Section
<ul style="list-style-type: none"> <li>(i) details of all the development footprint alternatives considered;</li> <li>(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;</li> <li>(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;</li> <li>(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;</li> <li>(v) the impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- <ul style="list-style-type: none"> <li>(aa) can be reversed;</li> <li>(bb) may cause irreplaceable loss of resources;</li> <li>and</li> <li>(cc) can be avoided, managed or mitigated;</li> </ul> </li> <li>(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;</li> <li>(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;</li> <li>(viii) the possible mitigation measures that could be applied and level of residual risk;</li> <li>(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and</li> <li>(xi) a concluding statement indicating the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;</li> </ul>	<p>alternatives is included in <b>section 8</b>. The public participation process followed is detailed in <b>section 9</b>. Additionally, all public participation documents are included in <b>Appendix 7</b>. This includes a summary of issues raised by I&amp;AP's and key stakeholders, and the responses to their comments. A full description of the environmental attributes within the application site is included in <b>section 6</b>. The impacts, risks and mitigation associated with each alternative are assessed in <b>section 7.2</b>. The methodology used in identifying the impacts and risks associated with each alternative is included in <b>section 7.1</b>. The positive and negative impacts, along with the proposed mitigation measures related to the proposed activity will have on the environment are discussed in <b>section 7.2</b> and <b>7.3</b>. The outcome of the site selection matrix is included in <b>section 5.4</b>. A concluding statement indicating the preferred alternatives is contained in <b>section 8.1</b> and <b>12</b>.</p>

Content Requirements	Applicable Section
<p>(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including—</p> <ul style="list-style-type: none"> <li>(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and;</li> <li>(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;</li> </ul>	<p>The process undertaken to assess the impacts as well as the assessment of impacts by each specialist are shown in <b>section 7.1</b>. Each environmental issue and risk are tabulated in <b>section 7.2</b>, and an assessment of the significance of each issue before and after mitigation measures is included.</p>
<p>(j) an assessment of each identified potentially significant impact and risk, including—</p> <ul style="list-style-type: none"> <li>(i) cumulative impacts;</li> <li>(ii) the nature, significance and consequences of the impact and risk;</li> <li>(iii) the extent and duration of the impact and risk;</li> <li>(iv) the probability of the impact and risk occurring;</li> <li>(v) the degree to which the impact and risk can be reversed;</li> <li>(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and the degree to which the impact and risk can be mitigated</li> </ul>	<p>The impact rating system contained in <b>section 7.1.2</b> details the methodology for determining the significance of an impact. This includes the points (i) to (vii) of point (j) in Appendix 3 of the EIA Regulations, 2014 (as amended). The assessment of each risk identified by the specialists is contained in <b>section 7.2</b>.</p>
<p>(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;</p>	<p>All relevant specialist findings are included in <b>section 6</b>, with all recommended mitigation measures detailed in <b>section 7</b>. The mitigation measures have been incorporated into the Draft Environmental Management Programme (EMPr) which is contained in <b>Appendix 8</b>. The tabulated summary of key specialist findings and recommendations is included in <b>section 12.1</b> and in the executive summary.</p>
<p>(l) an environmental impact statement which contains—</p> <ul style="list-style-type: none"> <li>(i) a summary of the key findings of the environmental impact assessment;</li> <li>(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the</li> </ul>	<p>The summary of key findings are found in <b>section 12.1</b>. The high-quality maps showing the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the</p>

Content Requirements	Applicable Section
<p>environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and</p> <p>(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;</p>	<p>preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers, can be found in <b>Appendix 5</b>. The summary of the positive and negative impacts and risks of the proposed activity and identified alternatives can be found in <b>section 7</b>.</p>
<p>(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;</p>	<p>The recommended mitigation measures associated with each impact are included in <b>section 7</b>. Overall specialist recommendations and mitigation measures are also included in <b>section 7</b>. These measures are contained in the Draft EMPr which can be found in <b>Appendix 8</b>.</p>
<p>(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;</p>	<p>The final proposed alternatives are included in <b>section 8</b>, including a comparative assessment by the specialists.</p>
<p>(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;</p>	<p>Any aspects identified by specialists or the EAP that should be included as conditions of the authorisation are identified in <b>section 12</b> and in the executive summary.</p>
<p>(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;</p>	<p>All assumptions and limitations are highlighted in <b>section 2</b>.</p>
<p>(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;</p>	<p>A reasoned opinion as to whether the proposed activity should be authorised, and, any conditions that should be made in respect of that authorisation can be found in <b>section 12</b> and in the executive summary.</p>
<p>(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post-construction monitoring requirements finalised;</p>	<p>The period required for the environmental authorisation, as well as the date on which the activity and post-construction monitoring will be concluded is addressed in <b>section 12</b> and in the executive summary.</p>

Content Requirements	Applicable Section
<p>(s) an undertaking under oath or affirmation by the EAP in relation to:</p> <ul style="list-style-type: none"> <li>(i) the correctness of the information provided in the reports;</li> <li>(ii) the inclusion of comments and inputs from stakeholders and I&amp;APs;</li> <li>(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and</li> <li>(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;</li> </ul>	<p>The EAP affirmation is included in <b>Appendix 3</b>.</p>
<p>(t) where applicable, details of any financial provision for the rehabilitation, closure, and on-going post decommissioning management of negative environmental impacts;</p>	<p>Where applicable, details of any financial provisions for the rehabilitation, closure, and on-going post decommissioning management of negative environmental impacts are included in <b>section 11, section 12</b> and the executive summary.</p>
<p>(u) an indication of any deviation from the approved scoping report, including the plan of study, including—</p> <ul style="list-style-type: none"> <li>(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and</li> <li>(ii) a motivation for the deviation;</li> </ul>	<p>Indication and motivations of deviations, if applicable, can be found in <b>section 1</b> and <b>section 4</b>.</p>
<p>(v) any specific information that may be required by the competent authority; and</p>	<p>Noted. As part of the DEIAr Comment Letter, the DEFF detailed specific information requirements and/or comments. These requirements and/or comments are tabulated in <b>section 1.3</b>, along with an explanation of how the comments have been addressed and/or requirements have been met. All correspondence from the DEFF is included in <b>Appendix 4</b>.</p>
<p>(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.</p>	<p>Noted. All requirements in terms of section 24(4)(a) and (b) of the Act have been met in this report.</p>
<p>(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a scoping report, the requirements as indicated in such notice will apply.</p>	<p>The EIA process has been based on the findings of the Initial Site Sensitivity Verification which was undertaken by majority of the specialists during the Scoping Phase.</p>

Content Requirements	Applicable Section
	In addition, all specialist assessments which have been undertaken as part of the EIA process comply with Appendix 6 of the EIA Regulations promulgated under sections 24(5) and 44 of NEMA. The specialist assessments which have been undertaken are listed in <b>section 1.2</b> , and the summary of the findings are detailed in <b>section 12.1</b> .

## 1.2 Specialist Studies

Specialist studies have been conducted in terms of the stipulations contained within **Appendix 6** of the 2014 NEMA EIA Regulations, as amended.

The following specialist studies have been conducted prior to and during the Scoping Phase to identify and assess the issues associated with the proposed development, as well as to comparatively assess all project alternatives:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment;
- Surface Water Impact Assessment;
- Desktop Agricultural and Soils Impact Assessment;
- Desktop Geotechnical Impact Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Palaeontology Impact Assessment;
- Desktop Social Impact Assessment; and
- Transportation Impact Assessment.

The above-mentioned specialist studies were also undertaken to inform the impact assessment which took place in the EIA phase of the proposed development. In the scoping phase, the specialists assessed the entire application site. The specialist assessments also included the identification of sensitive areas. Based on the scoping phase specialist assessments which were conducted, a few potentially sensitive areas have been identified within the application site. These sensitive areas were subsequently used during the scoping phase to inform the area for the potential erection of PV modules within the application site (referred to as the PV development area)<sup>9</sup>. In addition, the proposed PV development area that was presented in the Draft Scoping Report (DSR) and Final Scoping Report (FSR) was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure which were investigated in the EIA phase. The

<sup>9</sup> PV modules will not necessarily be erected in the entire proposed PV array areas, particularly where PV modules cannot be placed (e.g. under the existing 400kV transmission lines)

sensitive and 'no-go' areas also informed the preliminary assessment of layout alternatives (**section 8**) and have been further assessed during the EIA phase.

During the EIA phase, once the layout of the solar PV energy facility had been determined, the above-mentioned specialist assessments were updated / revised to focus on specific impacts of the proposed PV array / development areas and solar PV energy facility infrastructure in detail. The updates / revisions included the following (where required):

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV array areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

It should be noted that the Heritage Impact Assessment was originally undertaken via desktop means, however, following the desktop assessment, it was identified that further field truthing would need to be undertaken through an archaeological walk down. The aim of this was to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMP). This field truthing exercise was subsequently undertaken in August 2019 and the results have been incorporated into this Final Environmental Impact Assessment Report (FEIAR), as well as the updated Heritage Impact Assessment Report (**Appendix 6D**).

Key issues relating to the proposed site are discussed in **section 6** and **section 7**.

It should be noted that based on the pre-application meeting held with the DEFF on 19 February 2019, it was confirmed that the specialists could compile one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects as well as the three (3) associated grid infrastructure developments (substations and 132kV power lines), provided the findings and impact assessment sections are project-specific. A copy of the pre-application meeting minutes is provided in **Appendix 9B**.

### **1.3 Decision-Making Authority Consultation**

The DEFF is the competent authority on this project. It should be noted that a Pre-Application Meeting was undertaken on the 19<sup>th</sup> of February 2019 (prior to the submission of the application for EA and DSR) with representatives from the EAP, applicant and the DEFF. This meeting was undertaken in order to provide the DEFF with an overview of the proposed development, to discuss details regarding the proposed EIA process, to confirm whether the DEFF is in agreement with the approach proposed and to ascertain any specific requirements regarding report writing. In addition, the EAP also sought to understand the DEFF's approach and policy should the proposed development uncover environmental issues during the EIA process. The pre-application meeting minutes were sent to all attendees for review and the final minutes are included in **Appendix 9B**.

An application for EA for the proposed development was submitted to the DEFF on Friday the 26<sup>th</sup> of July 2019. The proof of payment for the application fee, details of the EAP and declaration of



Independence, declaration signed by the Applicant, the project schedule, details of landowners, landowner consents, and locality map formed part of the application form. The DSR was submitted to the DEFF on the same day that the application for EA was submitted (namely Friday the 26<sup>th</sup> of July 2019). Acknowledgement of receipt of both the application for EA and DSR was subsequently received on Monday the 29<sup>th</sup> of July 2019 (see **Appendix 4**) and the following DEFF reference number was allocated: 14/12/16/3/3/2/1135. The DEFF provided comments on the DSR on Monday the 26<sup>th</sup> of August 2019. The FSR subsequently addressed the comments made by the DEFF in the DSR comment letter (see **Appendix 4**). The FSR along with a Plan of Study (PoS) for the EIA phase was submitted to the DEFF for decision making on Friday the 06<sup>th</sup> of September 2019 and the DEFF subsequently acknowledged having received this on Monday the 09<sup>th</sup> of September 2019 (see **Appendix 4**). It should be noted that the DEFF accepted the FSR and PoS for the EIA phase and provided comments on Tuesday the 08<sup>th</sup> of October 2019 (see **Appendix 4**). Following the acceptance of the FSR and plan of study for the EIA phase, the FSR was updated and the DEIAR was submitted to the DEFF on Friday the 22<sup>nd</sup> of November 2019. The report was also made available for a 30-day public review and comment from Friday the 22<sup>nd</sup> of November 2019 to Monday the 13<sup>th</sup> of January 2020 (excluding public holidays and the DEFF's closure period) After evaluating the DEIAR the DEFF issued a letter, dated 04 December 2019, containing comments on the DEIAR which needed to be addressed and/or taken into consideration in the FEIAR. The table below provides details as to how the comments from the DEFF with regards to the DEIAR have been addressed and/or taken into consideration. For further details, refer to **Appendix 4** for a copy of the DEFF's DEIAR Comment Letter.

**Table 2:** Comments on the DEIAR as detailed in the DEIAR Comment Letter

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
This Department has the following comments on the application:	
<b>(a) Listed Activities</b>	
(i) Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	The EAP has ensured that all relevant listed activities have been applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description. Only the applicable activities to the proposed development have been applied for and included in the FEIAR and the application form. The relevant listed activities being applied for are detailed in <b>Table 8</b> in <b>section 4.1.3</b> of this FEIAR. It should be noted that an updated application form was submitted with the FEIAR and the EAP has ensured that the listed activities are the same and correct in both the FEIAR and application form.
(ii) If the activities applied for in the application form differ from those mentioned in the final EIAR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link	The activities applied for in the application form are identical to those mentioned in this FEIAR. An updated application form was submitted with the FEIAR and the EAP has ensured that the listed activities are the same and correct in both the FEIAR and application form. The relevant listed activities being applied for are

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
<a href="https://www.environment.gov.za/documents/forms">https://www.environment.gov.za/documents/forms</a> .	detailed in <b>Table 8</b> in <b>section 4.1.3</b> of this FEIAR.
(iii) The EAP must specify and list the relevant sub regulations for each listed activity.	The EAP has specified and listed the relevant sub regulations for each listed activity applied for. The relevant listed activities and respective sub regulations applied for are detailed in <b>Table 8</b> in <b>section 4.1.3</b> of this FEIAR.
<b>(b) Public Participation</b>	
(i) Please ensure that all issues raised and comments received during the circulation of the draft EIAr from registered I&APs and organs of state which have jurisdiction ( <u>including this Department's Biodiversity Section</u> ) in respect of the proposed activity are adequately addressed and included in the final EIAr. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 and 44 of the EIA Regulations 2014.	<p>All issues raised and comments received during the circulation of the DEIAR from registered I&amp;APs, key stakeholders and OoS / authorities which have jurisdiction in respect of the proposed activity (<u>including the DEFF's Biodiversity Section</u>) have been adequately addressed in this FEIAR and are included in the C&amp;RR (<b>Appendix 7E</b>). Proof of correspondence with the various I&amp;APs and key stakeholders / OoS / authorities has been included in <b>Appendix 7D</b> of this FEIAR. All issues raised and comments received from registered I&amp;APs, key stakeholders and OoS / authorities have also been summarised in <b>Table 39</b> in <b>section 9.10.1</b> of this FEIAR.</p> <p>It should be noted that attempts were made to obtain comments from registered I&amp;APs, key stakeholders / OoS / authorities. I&amp;APs, key stakeholders / OoS / authorities were reminded to provide comments before the end of the relevant 30-day review and comment periods. Proof of this is included in <b>Appendix 7B</b>. In addition, attempts were made to contact all stakeholders / OoS / authorities who did not comment on the DEIAR. This is detailed in <b>Table 37</b>. Proof of this follow-up was included in previous reports (DSR, FSR and DEIAR) and is also included in this FEIAR (<b>section 9.8</b>), as well as in <b>Appendix 7I</b>.</p> <p>All issues raised and comments received during the circulation of the DEIAR are included and adequately addressed in the FEIAR.</p> <p>It should be noted that the Public Participation Process has been conducted in accordance with Regulation 39, 40, 41, 42, 43 and 44 of the EIA Regulations 2014, as amended. Please refer to <b>section 9</b> and <b>Appendix 7</b> of this FEIAR for details regarding the Public Participation</p>

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
	Process which was conducted as part of the EIA process.
(ii) Proof of correspondence with the various stakeholders must be included in the final EIAR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EtA Regulations 2014, as amended.	<p>Proof of correspondence with the various I&amp;APs and key stakeholders / OoS / authorities has been included in <b>Appendix 7D</b> of this FEIAR. All issues raised and comments received from registered I&amp;APs, key stakeholders and OoS / authorities have also been summarised in <b>Table 39</b> in <b>section 9.10.1</b> of this FEIAR.</p> <p>As mentioned, the Public Participation Process has been conducted in accordance with Regulation 39, 40, 41, 42, 43 and 44 of the EIA Regulations 2014, as amended. Please refer to <b>section 9</b> and <b>Appendix 7</b> of this FEIAR for details regarding the Public Participation Process which was conducted as part of the EIA process.</p>
<b>(c) Environmental Management Programme</b>	
(i) The EMPr must include a provision to make the following reports available to the Department and applicable competent authority on request: alien / invasive plant management report; plant rescue and protection report; and re-vegetation and habitat rehabilitation report, etc.	<p>The Draft EMPr included as part of this FEIAR (<b>Appendix 8</b>) has been updated to include a provision to make the following reports available to the Department and applicable competent authority on request:</p> <ul style="list-style-type: none"> <li>▪ alien / invasive plant management report;</li> <li>▪ plant rescue and protection report;</li> <li>▪ re-vegetation and habitat rehabilitation report; and</li> <li>▪ any other relevant report(s) the Department and applicable competent authority might require.</li> </ul> <p>Please refer to <b>section 6.1</b> of the Draft EMPr for the above-mentioned provision.</p>
(ii) In addition to the above, the EMPr must comply with Appendix 4 of the EIA Regulations, 2014, as amended.	The EAP has ensured that the Draft EMPr included as part of this FEIAR ( <b>Appendix 8</b> ) has complied with Appendix 4 of the EIA Regulations, 2014, as amended. Please refer to <b>section 2</b> of the Draft EMPr for details regarding how the EMPr has complied with Appendix 4 of the EIA Regulations, 2014, as amended.
<b>(d) Cumulative Impact</b>	
(i) Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed	Cumulative impacts for similar projects within a 35km radius of the proposed development site have been identified and assessed by the respective specialists ( <b>section 7.3</b> ). The

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
<p>impacts must be refined to indicate the following:</p> <ul style="list-style-type: none"> <li>- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.</li> <li>- Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.</li> <li>- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.</li> <li>- A cumulative impact environmental statement on whether the proposed development must proceed.</li> </ul>	<p>cumulative impact assessment for all identified and assessed impacts has indicated the following (where possible):</p> <ul style="list-style-type: none"> <li>- Clearly defined cumulative impacts (and where possible the size of the identified impact) have been quantified and indicated (i.e. hectares of cumulatively transformed land).</li> <li>- A detailed process flow has been included in <b>section 7.3</b> to indicate how the specialists' recommendations, mitigation measures and conclusions from various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.</li> <li>- Identified cumulative impacts associated with the proposed development have been rated with the significance rating methodology used in the EIA process (<b>section 7.1</b> and <b>section 7.3</b>).</li> <li>- The significance rating has also informed the need and desirability of the proposed development.</li> <li>- A cumulative impact environmental statement on whether the proposed development must proceed has been included.</li> </ul> <p>Refer to <b>section 7.3</b> for details regarding the findings of the cumulative impact assessment.</p>
<b>(e) Specialist Declaration of Interest</b>	
<p>(i) Specialist Declaration of Interest forms must be attached to the final EIAR. You are therefore requested to submit original signed Specialist Declaration of Interest forms for each specialist study conducted. The forms are available on Department's website (please use the Department template).</p>	<p>Original signed Specialist Declaration of Interest forms have been attached to the FEIAR as <b>Appendix 3</b>. Original signed Specialist Declaration of Interest forms have been provided for each specialist study conducted. The forms which are available on Department's website were used.</p>
<b>(f) Undertaking of an Oath</b>	
<p>(i) The Department has noted that the submitted application form has an undertaking under oath or affirmation by EAP. However, the afore-mentioned oath</p>	<p>Please be advised that an undertaking under oath or affirmation by the EAP was attached as <b>Appendix 3</b> of the DEIAR. Another copy of the undertaking under oath or affirmation by the</p>

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
<p>was not included in the draft EIAr, but rather an appendix of the application form attached to the EIAr. Please note that the final EIAr must also have an undertaking under oath / affirmation by the EAP.</p>	<p>EAP has however been attached in <b>Appendix 3</b> of this FEIAr again for convenience.</p>
<p>(ii) Based on the above, you are therefore required to include an undertaking under oath or affirmation by the EAP (administered by a Commissioner of Oaths) as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended, which states that the EIAr must include:  <i>"an undertaking under oath or affirmation by the EAP in relation to:</i>  <i>(i) the correctness of the information provided in the reports;</i>  <i>(ii) the inclusion of comments and inputs from stakeholders and I&amp;APs;</i>  <i>(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and</i>  <i>(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties"</i></p>	<p>As mentioned above, an undertaking under oath or affirmation by the EAP (administered by a Commissioner of Oaths) as per Appendix 3 of the NEMA EIA Regulations, 2014 (as amended) has however been attached in <b>Appendix 3</b> of this FEIAr.</p>
<b>(g) Details and Expertise of the EAP</b>	
<p>(i) You are required to include the details and expertise of the EAP in the EIAr, including a curriculum vitae, in order to comply with the requirements of Appendix 3 of the NEMA EIA Regulations, 2014, as amended.</p>	<p>Details and expertise of the EAP have been detailed in <b>Table 4</b> in <b>section 1.4</b> of the FEIAr. In addition, curricula vitarum (CVs) for the EAP as well as the project team have also been included in <b>Appendix 2</b> of the FEIAr, in compliance with the requirements of Appendix 3 of the NEMA EIA Regulations, 2014 (as amended).</p>
<b>(h) General</b>	
<p>(i) The preferred Layout Plan with the preferred service routes, existing roads and new roads, and construction camp must be indicated in the final EIAr. A map combining the final Layout Plan superimposed (overlain) on the environmental sensitivity map must also be included in the final EIAr.</p>	<p>A copy of the final preferred layout map with the locations for the proposed laydown / staging areas and internal access roads has been provided in <b>Figure 54</b> in <b>section 8.2</b> of this report, as well as in <b>Appendix 5</b>. This is a final Layout Plan superimposed (overlain) on identified environmental sensitivities. All available biodiversity information has been used in the finalisation of the final preferred layout map. It should be noted that all sensitive and 'no-go' areas identified as part of the</p>

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
	<p>respective specialist assessments were used to inform the location of the PV array areas and all associated infrastructure (including layout alternatives). The final preferred layout map indicates the following:</p> <ul style="list-style-type: none"> <li>▪ PV array areas;</li> <li>▪ Temporary laydown area footprints;</li> <li>▪ O&amp;M building sites;</li> <li>▪ Internal roads;</li> <li>▪ Wetlands, drainage lines, rivers and streams;</li> <li>▪ The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure;</li> <li>▪ Substation(s) and/or transformer(s) sites including their entire footprint(s);</li> <li>▪ Location of access and service roads;</li> <li>▪ Buffer areas; and</li> <li>▪ All "no-go" areas.</li> </ul> <p>It should be noted that the final preferred layout map with the preferred service routes, existing roads and construction camp(s) can only be provided once the detailed design has been undertaken (final design details are yet to be confirmed). An updated final preferred layout map with the preferred service routes, existing roads and construction camp(s) will be submitted to the Department for comment and approval prior to construction commencing.</p>
(ii) Please ensure that all hardcopy and softcopy maps are clear and legible. Hardcopy maps must be at least A3 size.	The EAP has ensured that all hardcopy and softcopy maps are clear and legible. Maps are provided in <b>Appendix 5</b> of the FEIAR. Hardcopy maps provided in <b>Appendix 5</b> are A3 size, as requested.
(iii) Please note that the final EIAr must comply with all conditions of the acceptance of the seeping report signed on 08 October 2019, and must address all comments contained in the FSR and this letter.	The FEIAR has complied with all conditions of the acceptance of the seeping report signed on 08 October 2019, and has addressed all comments contained in the FSR and this letter
(iv) The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions.	Technical details for the proposed facility (including descriptions and/or dimensions) have been provided in the executive summary and <b>section 3.2</b> . This information has been provided in a table format ( <b>Table 6</b> and <b>Table 7</b> ).

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
<p>You are further reminded that the final EIAr to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of the EIAr in accordance with Appendix 3 of the EIA Regulations, 2014.</p>	<p>The FEIAr which was submitted to the Department has complied with all the requirements in terms of the scope of assessment and content of the EIAr in accordance with Appendix 3 of the EIA Regulations, 2014 (as amended). Please refer to <b>Table 1</b> in <b>section 1.1</b> of the FEIAr.</p>
<p>You are further reminded to comply with Regulation 23(1)(a) of the NEMA EIA Regulations, 2014, as amended, which states that:</p> <p><i>"The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority- (a) an environmental impact assessment report inclusive of any specialist reports, and an EMPr, which must have been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority."</i></p>	<p>The EAP has complied with Regulation 23(1)(a) of the NEMA EIA Regulations, 2014 (as amended), accordingly. The FEIAr has been submitted to the competent authority within 106 days of the acceptance of the scoping report. The DEFF accepted the FSR and Plan of Study (PoS) for the EIA phase and provided comments on Tuesday the 08<sup>th</sup> of October 2019. The FEIAr was submitted to the DEFF on Thursday the 13<sup>th</sup> of February 2020.</p>
<p>Should there be significant changes or new information that has been added to the EIAr or EMPr which changes or information was not contained in the reports or plans consulted on during the initial public participation process, you are therefore required to comply with Regulation 23(1)(b) of the NEMA EIA Regulations, 2014, as amended, which states:</p> <p><i>"The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority- (b) a notification in writing that the reports, and an EMPr, will be submitted within 156 days of acceptance of the scoping report by the competent authority or where regulation 21(2) applies, within 156 days of receipt of the application by the competent authority, as significant changes have been made or significant new information has been added to the environmental impact assessment report or EMPr, which changes or information was not contained in the reports consulted on during the initial public participation process contemplated in subregulation (1)(a) and that the revised environmental impact assessment report or, EMPr will be subjected to another public participation process of at least 30 days".</i></p>	<p>The EAP has complied with Regulation 23(1)(b) of the NEMA EIA Regulations, 2014 (as amended). There has been no significant changes or new information that has been added to the EIAr or EMPr which changes, or information which was not contained in the reports or plans consulted on during the initial public participation process.</p>
<p>Should you fail to meet any of the timeframes stipulated in Regulation 23 of the NEMA EIA</p>	<p>The Department's comment is duly acknowledged. The EAP has ensured that the timeframes stipulated in Regulation 23 of the</p>

Comment made by the DEFF / Additional Information Required by the DEFF	Notes / Comments / Responses
Regulations, 2014, as amended, your application will lapse.	NEMA EIA Regulations, 2014 (as amended) were met, in order to ensure that the application did not lapse.
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.	The Department's comment is duly acknowledged. The proposed development will not proceed without an EA being granted by the DEFF.
You are requested to submit one (1) full colour hard copy of the EIAr to the Department and at least one electronic copy (USB) of the complete final report with the hard copy documents. Kindly could the final reports not be submitted in lever arch files, but rather bound (ring or glued).	The Department's comment is duly acknowledged. One (1) full colour hard copy and one electronic copy (on USB) of the FEIAr (including appendices) has been submitted to the Department. The hard copy reports were not be submitted in lever arch files, but were rather bound.

A record of all decision-making authority consultation is included within **Appendix 4**.

#### 1.4 Expertise of Environmental Assessment Practitioner (EAP)

SiVEST has considerable experience in the undertaking of EIAs. Staff and specialists who have worked on this proposed development and contributed to the compilation of this FEIAr are detailed in **Table 3** below.

**Table 3: Project Team**

Name	Organisation	Role
Andrea Gibb*	SiVEST	Lead Project Coordinator and Visual Reviewer
Stephan Jacobs	SiVEST	Environmental Consultant / EAP
Hlengiwe Ntuli	SiVEST	Public Participation Consultant
Liandra Scott-Shaw	SiVEST	Environmental Consultant / Lead Project Coordinator
Kerry Schwartz	SiVEST	GIS, Mapping and Visual*
Stephen van Staden	Scientific Aquatic Services (SAS)	Visual Peer / External Reviewer
Stephen Burton	SiVEST	Surface Water*
Bruce Scott-Shaw	NatureStamp	Surface Water Peer / External Reviewer
Merchandt Le Maitre	SiVEST	Transportation*
Richard Hirst	SiVEST	Transportation Reviewer
Arnold Bell	Bell Consulting	Transportation Peer / External Reviewer



Name	Organisation	Role
Johann Lanz	Private	Agriculture & Soils
Chris van Rooyen	Chris van Rooyen Consulting	Avifauna
Wouter Fourie	PGS Heritage	Heritage, Archaeology & Cultural Landscape
Elize Butler	Banzai Environmental for PGS Heritage	Palaeontology
Neville Bews	Dr Neville Bews & Associates	Social
David Hoare	David Hoare Consulting	Terrestrial Ecology
Cecilia Canahai	JG Afrika	Geotechnical

\* No longer employed by SiVEST

\*Specialist assessments undertaken by SiVEST's in-house specialists. Assessments have been externally reviewed by suitably qualified specialists. Details regarding the specialists who were appointed to undertake external reviews of the in-house specialist assessments have been provided in table above. In addition, CVs of these specialists have been provided in **Appendix 2**. Original copies of the Declarations of Independence (Dols) for the specialists who externally reviewed SiVEST's in-house specialist studies provided in **Appendix 3**.

As per the requirements of the NEMA (2014, amended in 2017), the details and level of expertise of the person(s) who prepared the FEIAR are provided in **Table 4** below. The EAP Affirmation and Declaration of Independence (DoI) is contained in **Appendix 3**.

**Table 4:** Expertise of the EAP

<b>Environmental Assessment Practitioner (EAP)</b>	SiVEST SA (Pty) Ltd - Stephan Jacobs
<b>Contact Details</b>	stephanj@sivest.co.za
<b>Qualifications</b>	B.Sc. Environmental Sciences (undergraduate) and B.Sc. (Hons) Environmental Management and Analysis
<b>Expertise</b>	Stephan joined SiVEST in May 2015 and holds the position of Environmental Consultant in the Johannesburg and Pretoria offices. Stephan specialises in the field of Environmental Management and has been extensively involved in Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects / developments, in particular renewable energy projects / developments which form part of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). As such, Stephan has vast experience with regards to the compilation of EIAs and BAs. Additionally, Stephan has extensive experience in undertaking public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has considerable experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.
<b>Lead Project Coordinator /</b>	SiVEST SA (Pty) Ltd – Liandra Scott-Shaw

<b>Environmental Consultant</b>	
<b>Contact Details</b>	liandras@sivest.co.za
<b>Qualifications</b>	B.Sc. Biological Science and B.Sc. (Hons) Ecological Science
<b>Expertise</b>	Liandra joined SiVEST in January 2014 and holds the position of Environmental Consultant in the Pietermaritzburg office. Liandra specialises in the field of Vegetation Ecology and Environmental Management and has been involved in the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs) and specialist vegetation studies since joining SiVEST.

Please refer to attached CV's in **Appendix 2** for more information. Dols from each specialist are contained in **Appendix 3**. The EAP Affirmation / declaration is also contained in **Appendix 3**.

## 1.5 Final Environmental Impact Assessment Report (FEIAR) Structure

This FEIAR is structured as follows:

- **Chapter 1** introduces the proposed development and explains the objectives of the EIA Phase. It also provides a background to the proposed development and the environmental impact process. The chapter also points out the specialist studies for the proposed development and describes the authority consultation thus far. Furthermore, the chapter discusses the experience of the EAP as well as specialists who have contributed to the report.
- **Chapter 2** elaborates on the assumptions and limitations pertaining to the EIA process for the proposed development.
- **Chapter 3** presents the technical description of the proposed development, including a description of alternatives being considered.
- **Chapter 4** expands on the relevant legal ramifications applicable to the proposed development and describes relevant development strategies and guidelines.
- **Chapter 5** provides explanation to the need and desirability of the proposed development.
- **Chapter 6** provides a description of the region in which the proposed development is intended to be located. Although the chapter provides a broad overview of the region, it is also specific to the application. It contains descriptions of the site and the specialist studies conducted during the scoping and EIA phases are also summarised.
- **Chapter 7** identifies potential impacts associated with the proposed solar PV energy facility. The chapter further identifies these impacts per specialist study and discusses potential cumulative impacts per environmental issue (i.e. per specialist study). In addition, a rating of each environmental issue before and after the implementation of mitigation measures is also presented.
- **Chapter 8** discusses layout alternatives, including how they relate to sensitive areas identified by specialists and provides a preliminary comparison of alternatives.
- **Chapter 9** describes the Public Participation Process (PPP) undertaken during the EIA Phase and tables issues and concerns raised by Interested and/or Affected Parties (I&APs) and key stakeholders.

- **Chapter 10** Provides a description of the environmental monitoring and auditing process to be undertaken for the proposed development.
- **Chapter 11** provides an assessment of the report in terms of the World Bank Standards and Equator Principles. This chapter presents a checklist that ensures that the report has been compiled according to the requirements of the World Bank Standards and Equator Principles.
- **Chapter 12** summarises the findings and recommendations per specialist study and provides the overall conclusion.
- **Chapter 13** outlines the processes to be followed, following the submission of the FEIAR.
- **Chapter 14** lists references indicated in the FEIAR.

## 2 ASSUMPTIONS AND LIMITATIONS

### 2.1 General Assumptions and Limitations

- It is assumed that all information provided to the Environmental Team by the applicant was correct and valid at the time it was provided.
- It is not always possible to involve all I&APs individually, however, every effort has been / is being made to involve as many interested parties as possible. It is also assumed that individuals representing various associations or parties convey the necessary information to these associations / parties.
- It is assumed that the information provided by the various specialists is unbiased and accurate.
- It is not possible to determine the actual degree of the impact that the development will have on the immediate environment without some level of uncertainties. Actual impacts can only be determined following the commencement of construction and/or operation.
- SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

### 2.2 Specialist Assumptions and Limitations

The following assumptions, uncertainties and gaps in knowledge were encountered by the various specialists:

#### 2.2.1 *Terrestrial Ecology*

- The assessment is based on a single reconnaissance site visit from 4-8 February 2019. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was not adequate for describing seasonal floristic patterns on site in detail, but is adequate for understanding general patterns across affected areas. If

necessary, additional surveys will be recommended to compensate for any short-coming related to this.

- The vegetation was in reasonably good condition for sampling at the time of the field assessment, although extensive parts of the mountainous areas had been burnt prior to the field survey and could not be adequately sampled. Nevertheless, there are few limitations with regards to the vegetation sampling of the lowland areas and the species lists obtained for these areas is considered reliable and relatively comprehensive.
- Compiling the list of species that could potentially occur on-site is limited by the paucity of collection records for the area. The list of plant species that could potentially occur on-site was therefore taken from a wider area and from literature sources that may include species that do not occur on-site and may miss species that do occur on site. In order to compile a comprehensive site-specific list of the biota on-site, studies would be required that would include different seasons, be undertaken over a number of years and include extensive sampling. Due to time constraints, this was not possible for this study.
- Rare and threatened plant and animal species are, by their nature, usually very difficult to locate and can be easily missed.
- The faunal component of the study relies primarily on existing information, as available in various spatial databases and published accounts. These databases are not intended for fine-scale use and the reliability and adequacy of these data sources relies heavily on the extent to which the area has been sampled in the past. Many remote areas have not been well sampled with the result that the species lists for an area do not always adequately reflect the actual fauna and flora present at the site. In order to counter the likelihood that the area has not been well sampled in the past and in order ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger than the study area and are likely to include a much wider array of species than actually occur at the site. The study excludes Bats, Avifauna, Aquatic Ecology and Invertebrates.
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments of a similar nature that are within a 50km radius of the site.

### 2.2.2 Avifauna

The Avifauna study assumed that the sources of information used in the report are reliable. In this respect, the following must be noted:

- A total of 40 SABAP2 full protocol lists had been completed to date for the broader area where the proposed project is located [i.e. bird listing surveys lasting a minimum of two (2) hours each]. In addition, 12 ad hoc protocol lists [i.e. bird listing surveys lasting less than two (2) hours but still giving useful data] and 684 incidental sightings were also recorded. The SABAP2 data was therefore regarded as a good indicator of the avifauna which could occur at the proposed development area, and it was further supplemented by data collected during the on-site surveys.
- The focus of the study is primarily on the potential impacts on priority solar species.
- Priority solar species were defined as follows:
  - South African Red Data species;

- South African endemics and near-endemics;
- Raptors
- Waterbirds
- The impact of solar installations on avifauna is a new field of study, with only one (1) published scientific study on the impact of PV facilities on avifauna in South Africa (Visser *et al.*, 2019). Strong reliance was therefore placed on expert opinion and data from existing monitoring programmes at solar facilities in the USA where monitoring has been on-going since 2013. The precautionary principle was applied throughout as the full extent of impacts on avifauna at solar facilities is not presently known.
- The assessment of impacts is based on the baseline environment as it currently exists at the proposed development area.
- Cumulative impacts include all proposed and existing renewable energy projects within a 35km radius around the proposed development areas .
- Conclusions in the Avifauna study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The broader area is defined as the area encompassed by the nine (9) pentads where the project is located (see Figure 4 of the Avifauna Impact Assessment Report in **Appendix 6B**). The study area is defined as the combined area of the Mooi Plaats (part of a separate on-going EIA process with **DEFF Reference Number.: 14/12/16/3/3/2/1134**), Wonderheuvel, and Paarde Valley (part of a separate on-going EIA process with **DEFF Reference Number.: 14/12/16/3/3/2/1136**) PV assessment areas (see Figure 4 of the Avifauna Impact Assessment Report in **Appendix 6B**). The PV development footprint is defined as the combined area covered by the solar fields, internal roads, laydown areas and Operation & Maintenance (O&M) buildings.

### 2.2.3 Surface Water

- Where present, the investigation of both wetlands and riparian habitat were initially identified and delineated at a desktop level. These were then ground-truthed using a Global Positioning System (GPS) device and verified in the fieldwork phase. The GPS used is expected to be accurate from 5m up to 15m, depending on meteorological conditions. The initial delineations undertaken at a desktop level were refined following findings made in the fieldwork phase and points recorded in the field.
- The site visit was undertaken from the 5<sup>th</sup> to the 7<sup>th</sup> of February 2019. Due to seasonal wetland and riparian vegetation growth preferences, vegetation species can grow at different times / seasons of the year. As such, some hydrophytic wetland vegetation species may not have been present at the time of the assessment. Seasonal vegetation identification limitations therefore apply to this assessment given the short term once-off nature of the fieldwork component. The assessment should therefore not be undertaken to be a fully comprehensive study on wetland and riparian vegetation species occurrence.
- The study has focused on the possible identification and delineation of wetlands and riparian habitat (as defined herein) that are to be affected by the layout of the proposed development on the study site. Identification and delineation of potential wetlands and riparian habitat in the wider area outside of the proposed development area was only undertaken for possible

wetlands within 500m radius of the study site to make provision for Government Notice 509 of 2016 (No. 40229). A comprehensive study of wetlands and riparian habitat in the wider area was not undertaken.

- This study is limited to providing a surface water resources delineation, wetland and riparian zone ecological state [wetland Present Ecological State (PES) and Vegetation Response Assessment Index (VEGRAI) Ecological Condition (EC)] determination, wetland and riparian zone ecosystem services assessment, wetland and riparian habitat environmental importance and sensitivity classifications, an impact assessment and risk assessment in terms of Government Notice 509 of 2016 (No. 40229), where each of these assessments are applicable. No other assessments were undertaken or formed part of this study. As such, aquatic studies including fish, invertebrates and amphibians have not been included in this report. Nor have water quality, hydrological, floodline or groundwater studies been included. These will be undertaken separately and where necessary for the project.
- Use of database information for the desktop assessment included the National Freshwater Ecosystem Priority Areas (NFEPA, 2011) database. This database is a national level database and some smaller surface water resources may not be contained in the database. Additionally, mainly permanently saturated wetlands are included in the database. Therefore, wetlands with seasonal and temporary saturation cycles may not be included. The fieldwork component was included in the assessment to verify the desktop database information in order to address these shortcomings should wetlands have been identified.
- The risk assessment matrix as per Government Notice 509 of 2016 (No. 40229) was completed based on the current available layout plan. The risk assessment assumes a worst-case scenario approach in which the current layout is implemented but which also takes into consideration the recommended control measures.
- SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

#### 2.2.4 Agricultural and Soils

- The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.
- The study makes the assumption that water for irrigation is very limited across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and only very limited irrigation water has been exploited in this area.
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50km radius. The existing and proposed developments that were taken into consideration for cumulative impacts are listed in Appendix B of the Agricultural and Soils Impact Assessment Report (**Appendix 6**). SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are

not currently publicly available to download, and could therefore not be reviewed during this assessment.

- There are no other specific constraints, uncertainties and gaps in knowledge for this study.

### 2.2.5 Visual

- Given the nature of the receiving environment and the height of the proposed PV panels and power line towers, the study area or visual assessment zone is assumed to encompass an area of 5km from the boundary of the application sites. This limit on the visual assessment zone relates to the fact that visual impacts decrease exponentially over distance. Thus although the proposed development may still be visible beyond 5km, the degree of visual impact would diminish considerably. As such, the need to assess the impact on potential receptors beyond this distance would not be warranted.
- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation undertaken during the scoping phase of the project. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during a site visit which was undertaken between the 4<sup>th</sup> and the 7<sup>th</sup> of February 2019. Due to the extent of the study area, however, and the fact that many of the identified receptors are farmhouses on private property, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, a number of broad assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development. It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the proposed development. Thus the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that any visual impact will be experienced.
- For the purposes of the EIA-level study, all analysis is based on a worst-case scenario where PV panel height has been assumed to be 4m and substation structure heights have been assumed to be 25m.
- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for this area derived from the National Geo-Spatial Information (NGI)'s 25m DEM is fairly coarse and somewhat inconsistent and as such, localised topographic variations in the landscape may not be reflected on the Digital Elevation Model (DEM) used to generate the viewsheds.
- In addition the viewshed analysis does not take into account any existing vegetation cover or built infrastructure which may screen views of the proposed development. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.
- The potential visual impact at each visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three (3) main parameters relating to visual impact and, although relatively simplistic, it provides a reasonably accurate indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of

quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen merely as a representation of the likely visual impact at a receptor location.

- No feedback regarding the visual environment has been received from the public participation process to date, however, any feedback from the public during the review period of the DEIAR will be incorporated into further drafts of the visual report.
- At the time of undertaking the visual study no information was available regarding the type and intensity of lighting that will be required for the proposed solar energy facility and therefore the potential impact of lighting at night has not been assessed at a detailed level. However, lighting requirements are relatively similar for all solar PV energy facilities and as such, general measures to mitigate the impact of additional light sources on the ambience of the nightscape have been provided.
- This study includes an assessment of the potential cumulative impacts of other renewable energy developments on the existing landscape character and on the identified sensitive receptors. This assessment is based on the information available at the time of writing the report and where information has not been available, broad assumptions have been made as to the likely impacts of these developments.
- At the time of writing the report, the proposed PV layouts were still in the preliminary design phase and as such, no visualisation modelling was undertaken for the solar PV project. This can however be provided should the Public Participation process identify the need for this exercise.
- SiVEST made every effort to obtain information for the surrounding planned renewable energy developments (including specialist studies, assessment reports and Environmental Management Programmes), however, some of the documents are not currently publicly available for download. The available information was factored into the cumulative impact assessment (Section 5.4 of Visual Impact Assessment Report – **Appendix 6J**).
- It should be noted that the site visit was undertaken in the first week of February 2019, during mid to late summer, when most rainfall occurs. Typically, the visual impact of a PV project would be less significant during the rainy periods of the year than it would during the drier periods when the surrounding vegetation is expected to provide less potential screening. The study area is however typically characterised by low levels of rainfall and the vegetation cover is largely dominated by low shrubs. Thus, the season is not expected to have a significant effect on the visual impact of the proposed development.
- The weather conditions in the study area also affect the visual impact of the proposed development to some degree. The site visit was undertaken in clear weather conditions which tend to prevail for most of the year due to the low levels of rainfall in the area. In these clear conditions, PV panels would present a greater contrast with the surrounding landscape than they would during overcast conditions. The weather conditions during the time of the study were therefore taken into consideration when undertaking the Visual Impact Assessment (VIA).

### 2.2.6 Heritage

- Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the development area. Various factors account for this, including the subterranean nature of some archaeological sites. As



such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

- The accuracy of Palaeontological Impact Assessments, that is included as part of the Heritage Impact Assessment (HIA), is reduced by several factors which may include the following: the databases of institutions are not always up to date and relevant locality and geological information was not accurately documented in the past. Various remote areas of South Africa have not been assessed by palaeontologists and data is based on aerial photographs alone. Geological maps concentrate on the geology of an area and the sheet explanations were never intended to focus on palaeontological heritage.
- Similar Assemblage Zones, but in different areas, are used to provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations and Assemblage Zones generally assume that exposed fossil heritage is present within the development area. The accuracy of the Palaeontological Impact Assessment (PIA) is thus improved considerably by conducting a field-assessment.
- Due to the prohibitive size of the application area it was agreed that fieldwork related to the heritage assessment will only be done in the EIA phase when the footprint areas have been determined and significantly reduced, based on environmental sensitive areas determined by the other specialists.

#### 2.2.7 *Palaeontology*

- The accuracy of PIAs is reduced by several factors which may include the following: the databases of institutions are not always up to date and relevant locality and geological information was not accurately documented in the past. Various remote areas of South Africa has not been assessed by palaeontologists and data is based on aerial photographs alone. Geological maps concentrate on the geology of an area and the sheet explanations were never intended to focus on palaeontological heritage.
- Similar Assemblage Zones, but in different areas, are used to provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations and Assemblage Zones generally assume that exposed fossil heritage is present within the development area. The accuracy of the PIA is thus improved considerably by conducting a field-assessment.

#### 2.2.8 *Social*

- It is assumed that the technical information provided by the project proponent and the environmental consultants SiVEST, is credible and accurate at the time of compiling the report.
- It is also assumed that the data provided by the various specialists as used in this report are credible and accurate.
- The demographic data used in this report was sourced from Statistics South Africa and is based on data gathered during Census 2011. This data is somewhat outdated but where possible is supplemented with the latest Stats SA's survey data such as the Mid-year population estimates

and the Quarterly Labour Force Survey. The limitation of this is that this survey data is restricted to a provincial level and does not extend to a municipal level.

- Some of the information in the documentation available from the district and local municipalities was somewhat outdated but where ever possible that information was aligned with that available from Stats SA.

### 2.2.9 Transportation

- Based on the information provided by the client for assessment purposes, a maximum number of 2 000 000 PV modules will be constructed in a continuous sequence from the intended construction start date.
- PV modules will be either fixed-tilt mounting or single access tracking mounting, while the modules will either be crystalline silicone or thin-film technology. However, for this report it was assumed that 'fixed-tilt axis' mounting systems would be used as it would have the greatest impact on the development.
- Individual PV modules dimension will be  $\pm 1\text{m} \times \pm 2\text{m}$ , whilst each PV column will be  $\pm 2\text{m}$  wide and 1 - 4m high, dependent on the type of mounting system.
- A preliminary program of between 18 – 24 months is envisaged for the construction to be completed. Therefore, for the purpose of this assessment we have assumed the following;
  - Site Establishment & construction of Roads, Laydown Areas: 5 Months
  - Erection of PV frames and PV modules: 24 Months
  - Construction Operation & Maintenance Buildings: 24 Months
  - Electrical Cabling and Switching Stations: 24 Months
  - Access road width: 8m
  - Internal roads width: 4 – 12m
  - 6 Day work week: Monday – Saturday
  - PV Energy Facility Lifespan: 20 years
- Adjacent to this proposed development is the proposed Umsobomvu Wind Energy Farm (WEF) for which a route assessment report was completed by Messrs. AECOM SA (Pty) Ltd in 2016. We anticipate the adjacent WEF will in all likelihood use the same access point from the N10 freeway as this development and therefore extracts of their assessment report was used in this report.
- The WEF assessment report used the Port of Ngqura,  $\pm 20\text{km}$  north-east of Port Elizabeth as the point of origin for the delivery of WEF components. The most suitable route identified was to travel north-west on the N10 freeway towards Middelburg where it will continue north on the N9 freeway towards Noupoort and ultimately continue west again on the N10 towards Richmond where the access point is located at Km19.92. In addition, the report indicates Abnormal vehicles and WEF components of less than 4.8m in height will be able to use this route, they do however recommended that a formal route assessment report be completed by a reputable contractor prior to the works commencing.
- This assessment is limited to the impacts the development traffic will have on the network and not on the wider impacts known as background traffic. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods.

- The information provided in this report is an informed estimate. Construction-related traffic may however vary and be different to the information provided during construction phases as a result of supplier delivery schedule changes.

### 3 TECHNICAL DESCRIPTION

The proposed development will encompass the installation of a solar PV field and associated components [which includes, but is not limited to, internal access roads, one (1) on-site 33/132kV substation, one (1) 33/132kV collector substation, four (4) Operation and Maintenance (O&M) buildings and four (4) temporary laydown / staging areas<sup>10</sup>] in order to generate and feed electricity into the national grid. At this stage, it is anticipated that the proposed solar PV energy facility will include PV fields (arrays) comprising of up to approximately 1 371 429 PV modules, with each module occupying an area of approximately 2m<sup>2</sup>. In addition, the proposed solar PV energy facility will have a maximum total generation capacity of up to approximately 480MW. The total area of the application site assessed in the scoping phase is approximately 5 652ha, however, the proposed solar PV energy facility (including all associated infrastructure) is expected to occupy less than 1000ha of the application site. It should be noted that the location of the PV array areas and all associated infrastructure have been informed by the environmental sensitive and 'no-go' areas which were identified by the respective specialists. The proposed layout for the solar PV energy facility will be further refined and updated, should this be required.

The PV modules being proposed will be either fixed tilt-mounting or single-axis tracking mounting, and the modules will be either crystalline silicon or thin-film technology. Each module will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type.

Internal roads (up to 14m wide during construction and between 4m and 12m during operation) are also being proposed and will provide access to the PV arrays. Existing site roads will be used wherever possible, although new internal site roads will be constructed where necessary. It should be noted that the internal roads which will be used during construction will be partly rehabilitated, where possible.

Each proposed PV array area will require a temporary construction laydown / staging area. However, certain PV array areas will share laydown / staging areas. Up to a maximum of four (4) temporary construction laydown / staging areas of approximately 4ha each are thus being proposed for authorisation<sup>10</sup>. The temporary construction laydown / staging areas will have a total combined footprint of approximately 16ha. In addition, each proposed PV array area will require an Operation and Maintenance (O&M) building. However, certain PV array areas will share O&M buildings. Up to a maximum of four (4) O&M buildings are thus being proposed for authorisation<sup>10</sup>, each occupying a site of approximately 1ha. The O&M buildings will have a total combined footprint of approximately 4ha.

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<sup>10</sup> It should be noted that it is unlikely that the applicant will construct or make use of all of the authorised laydown / staging areas and O&M buildings, as certain PV array areas may share laydown / staging areas and O&M buildings (where possible). The applicant has requested that the maximum number of laydown / staging areas and O&M buildings be authorised as a precaution, should all of these be required. The number of laydown / staging areas and O&M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing)

Medium voltage cabling will link the PV plant to the grid connection infrastructure (132kV overhead power line, on-site substations and collector substations). These cables will be laid underground wherever technically feasible.

One (1) new 33/132kV on-site substation and one (1) new collector substation, each occupying an area of up to approximately 4ha, will be constructed. The proposed substations will act as step-up substations and will include an Eskom portion and an IPP portion, hence the substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA (**DEFF Reference Number: 14/12/16/3/3/1/2134**) to allow for handover to Eskom.

As mentioned, the electricity generated by the solar PV energy facility will be fed into the national grid via a 132kV overhead power line. This power line will however be assessed as part of a separate BA process (**DEFF Reference Number: 14/12/16/3/3/1/2134**).

During the scoping phase the entire application site was assessed in order to inform the preliminary comparison of the PV development area alternatives (**section 8.1**). The proposed PV development area that was presented in the DSR and FSR was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure which were investigated in the EIA phase. The sensitive areas also informed the preliminary assessment of layout alternatives which have been further assessed during the EIA phase. It should be noted that the layout of the PV array areas and associated infrastructure were dependent on the outcome of the specialist studies conducted during the EIA process, as well as the area available for the erection of PV panels. The layout alternatives and results of the comparative assessment of alternatives have been discussed in more detail in **section 8.2**.

### 3.1 Project Location

The proposed solar PV energy facility is located approximately 23km south-west of Noupoot, within the Umsobomvu Local Municipality, in the Pixley ka Seme District Municipality of the Northern Cape Province.

The application site which was assessed in the scoping phase is approximately 5 652ha in extent and includes the following properties:

- Remainder of the Farm Mooi Plaats No. 121;
- Portion 3 of the Farm Wonder Heuvel No. 140; and
- Portion 5 of the Farm Holle Fountain No. 133.

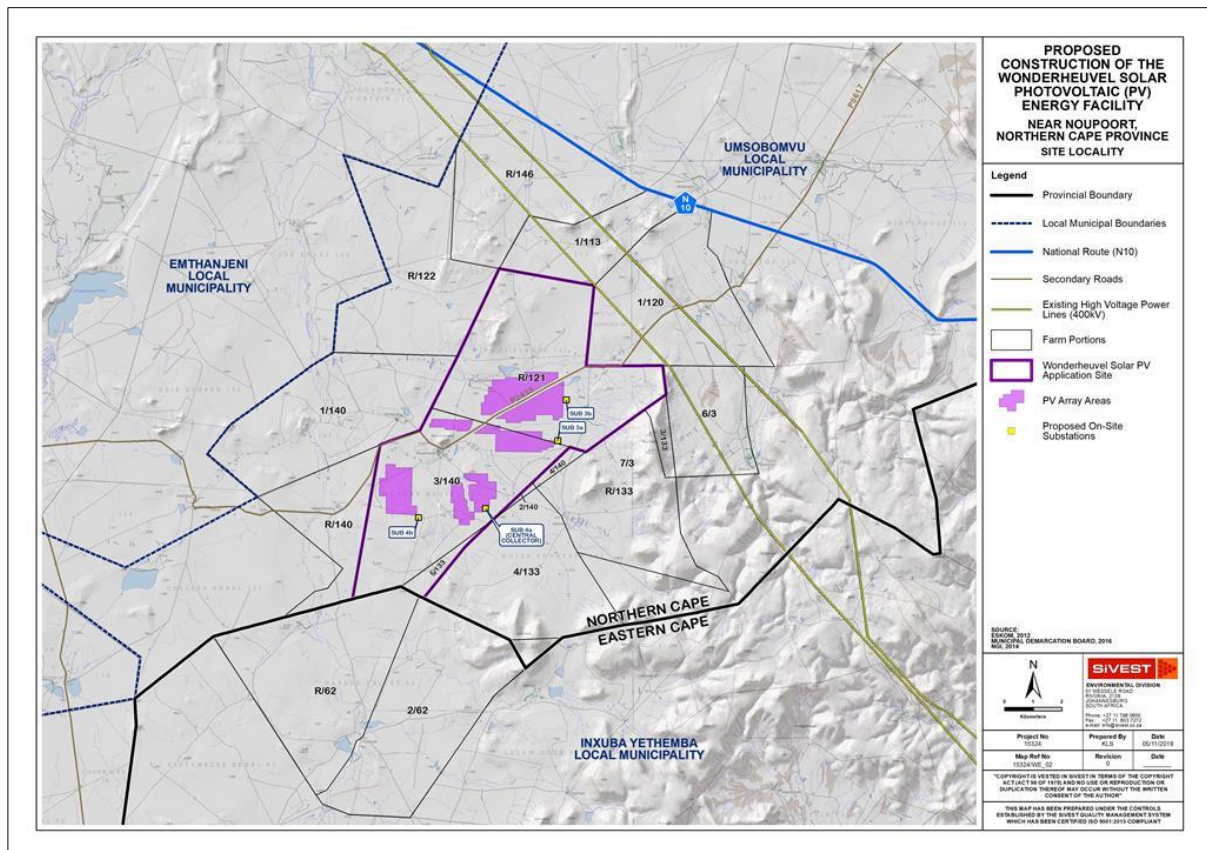
**Table 5:** Summary of application site and PV array area properties

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL (SG) CODE
Remainder of the Farm Mooi Plaats No. 121	C03000000000012100000
Portion 3 of the Farm Wonder Heuvel No. 140	C03000000000014000003
Portion 5 of the Farm Holle Fountain No. 133	C03000000000013300005
APPLICATION SITE	
CENTRE POINT COORDINATES (DD MM SS.sss)	

POINT	SOUTH	EAST
P	S31° 20' 3.011"	E24° 41' 58.521"
PV ARRAY AREAS		
CENTRE POINT COORDINATES (DD MM SS.sss)		
PHASE	SOUTH	EAST
PV ARRAY AREA 1	S31° 19' 20.917"	E24° 42' 27.573"
PV ARRAY AREA 2	S31° 19' 35.099"	E24° 42' 50.975"
PV ARRAY AREA 3	S31° 20' 14.911"	E24° 42' 26.343"
PV ARRAY AREA 4	S31° 19' 58.191"	E24° 41' 1.625"
PV ARRAY AREA 5	S31° 21' 11.854"	E24° 39' 50.368"
PV ARRAY AREA 6	S31° 21' 21.094"	E24° 41' 29.433"

The project site has been identified based on solar resource, grid connection suitability, competition, topography, land availability and site access.

The proposed development location is shown in the locality map (**Figure 3**) below.



**Figure 3:** Proposed solar PV energy facility site locality map

### 3.2 Solar PV Energy Facility Technical Details

Wonderheuvél Solar Power is proposing the construction of a solar PV energy facility and associated infrastructure (which includes, but is not limited to, internal access roads, on-site and collector substations, temporary laydown / staging areas and O&M buildings) with a maximum total generation capacity of up to approximately 480MW on the development site near Noupoot. As mentioned, the overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid. The proposed on-site and collector substations will have voltage capacities of up to 33/132kV and will be step-up substations.

The key technical details and infrastructure required are presented in the table below (**Table 6**).

**Table 6:** Wonderheuvél Solar PV Energy Facility summary of key components

PROJECT	DEFF REFERENCE	FARM NAME AND AREA
Wonderheuvél Solar PV Energy Facility	<u>14/12/16/3/3/2/1135</u>	<ul style="list-style-type: none"> <li>▪ Remainder of the Farm Mooi Plaats No. 121;</li> <li>▪ Portion 3 of the Farm Wonder Heuvél No. 140; and</li> <li>▪ Portion 5 of the Farm Holle Fountain No. 133.</li> </ul> <p><b>Area of Application Site = 5 652 ha</b>  <b>Extent of PV Array Areas (combined) = Approx. 863ha</b></p>
<b>TECHNICAL DETAILS OF ASSOCIATED INFRASTRUCTURE</b>		
	PV field (array)	<ul style="list-style-type: none"> <li>▪ PV field (array) will comprise of approx. 1 371 429 PV modules</li> <li>▪ Each module will occupy an area of approximately 2m<sup>2</sup></li> </ul>
	PV modules	<ul style="list-style-type: none"> <li>▪ PV modules will be either fixed-tilt mounting or single-axis tracking mounting, and modules will be either crystalline silicon or thin-film technology</li> <li>▪ Each module will be approx. 2m wide and between 1m and 4m in height, depending on mounting type</li> </ul>
	Access roads	<ul style="list-style-type: none"> <li>▪ Internal roads (up to 14m wide during construction and between 4m and 12m during operation) will provide access to PV arrays</li> <li>▪ Existing site roads will be used wherever possible, although new internal site roads will be constructed where necessary</li> <li>▪ Internal roads used during construction will be partly rehabilitated, where possible</li> </ul>
	Substations	<ul style="list-style-type: none"> <li>▪ Two (2) new substations. One (1) new 33/132kV on-site substation and one (1) new 33/132kV collector substation, each occupying an area of up to approx. 4ha</li> <li>▪ Total combined footprint of approx. 8ha</li> <li>▪ Will be step-up substations which will include an Eskom portion and an IPP portion</li> </ul>
	Temporary construction laydown / staging area	<ul style="list-style-type: none"> <li>▪ Each proposed PV array area will require a temporary construction laydown / staging area</li> <li>▪ Certain PV array areas will however share laydown / staging areas</li> </ul>

		<ul style="list-style-type: none"> <li>▪ Up to a max of four (4) areas of approx. 4ha each thus proposed</li> <li>▪ Total combined footprint of approx. 16ha, should all four (4) authorised laydown / staging areas be used<sup>10</sup></li> </ul>
	Operation and Maintenance (O&M) buildings	<ul style="list-style-type: none"> <li>▪ O&amp;M buildings will be provided for each PV array area, occupying a site of approx. 1ha each</li> <li>▪ Certain PV array areas will however share O&amp;M buildings</li> <li>▪ Up to four (4) O&amp;M buildings thus proposed</li> <li>▪ Total combined footprint of approx. 4ha, should all four (4) authorised O&amp;M buildings be constructed<sup>10</sup></li> </ul>
	On-site Electrical infrastructure IPP	<ul style="list-style-type: none"> <li>▪ Two (2) substations. One (1) on-site IPP substation and one (1) IPP collector substation</li> <li>▪ Up to approx. 4ha for each substation</li> <li>▪ Total combined footprint of approx. 8ha</li> <li>▪ Medium voltage cabling will link proposed PV facility to grid connection infrastructure</li> <li>▪ Cables will be laid underground wherever technically feasible, and overhead power lines will be used if required</li> </ul>

Based on comments on the FSR provided by the DEFF, the information in **Table 6** above has been summarised in the table below (**Table 7**), using the template provided by the DEFF in Annexure 2 of the FSR Acceptance Letter (**Appendix 4**).

**Table 7:** Summary of technical details

<b>Component</b>	<b>Description / dimensions</b>
Height of PV modules	Between 1m and 4m in height, depending on mounting type.
Area of PV Array	Combined area of approx. 863ha
Number of inverters required	Maximum of approx. 3 200
Area occupied by substations	One (1) on-site and one (1) collector substation, each occupying an area of up to approx. 4ha. Total combined footprint of approx. 8ha.
Capacity of on-site substation	Each substation (on-site and collector) will have a capacity of 33/132kV.
Area occupied by both permanent and construction laydown areas	Each PV array area will require a temporary construction laydown / staging area. Certain PV array areas will however share laydown / staging areas. Thus four (4) temporary construction laydown / staging areas, each occupying an area of approx. 4ha. Total combined footprint of approx. 16ha, should all four (4) authorised laydown / staging areas be used <sup>10</sup> .
Area occupied by buildings	Approx. 12ha, should all four (4) authorised O&M buildings be constructed <sup>10</sup>
Length of internal roads	Up to approx. 17.5km. Final lengths to be confirmed once Engineering, Procurement and Construction (EPC) contractor has been selected and design is finalised.

Width of internal roads	Up to 14m during construction (to be partly rehabilitated) and between 4m and 12m during operation. Existing site roads to be used wherever possible. However, where required, internal access roads will be constructed.
Proximity to grid connection	<b>Although the substations (on-site and collector) form part of this application, the power line is not part of this EIA, and is being applied for as part of a separate on-going Basic Assessment (BA) process (DEFF Reference Number: <u>14/12/16/3/3/1/2134</u>).</b>  Grid connection is to the Hydra D Main Transmission Substation (MTS) <sup>11</sup> , which will still be constructed, based on the preference for the overhead power line corridor route proposed as part of the electrical infrastructure BA (part of a separate on-going BA process with <b>DEFF Ref No.:</b> <u>14/12/16/3/3/1/2134</u> ). The proposed location for the Hydra D MTS is approx. 6.2km south-east of the application site.
Height of fencing	Approx. 2m high
Type of fencing	Galvanised steel

As mentioned, the proposed solar PV energy facility forms one (1) of three (3) solar PV energy facilities that are being proposed on adjacent farms as part of the greater Umsobomvu PV project. The other proposed developments which form part of the greater Umsobomvu PV project include the following:

- Mooi Plaats Solar PV – **DEFF Reference Number:** 14/12/16/3/3/2/1134 (part of a separate on-going EIA process); and
- Paarde Valley Solar PV – **DEFF Reference Number:** 14/12/16/3/3/1136 (part of a separate on-going EIA process).

In addition, a 132kV overhead power line and 33/132kV on-site and collector substations (namely the associated electrical infrastructure) are also being proposed to feed the electricity generated by the proposed solar PV energy facility into the national grid. The associated electrical infrastructure will however require a separate EA and is subject to a separate on-going BA process (**DEFF Reference Number:** 14/12/16/3/3/1/2134). The associated electrical infrastructure has been included in the solar PV energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The on-site and collector substations will be step-up substations and will include an Eskom portion and an IPP portion, hence the substations have been included in the solar PV energy facility EIA and in the associated electrical infrastructure BA to allow for handover to Eskom.

### 3.2.1 Solar Field

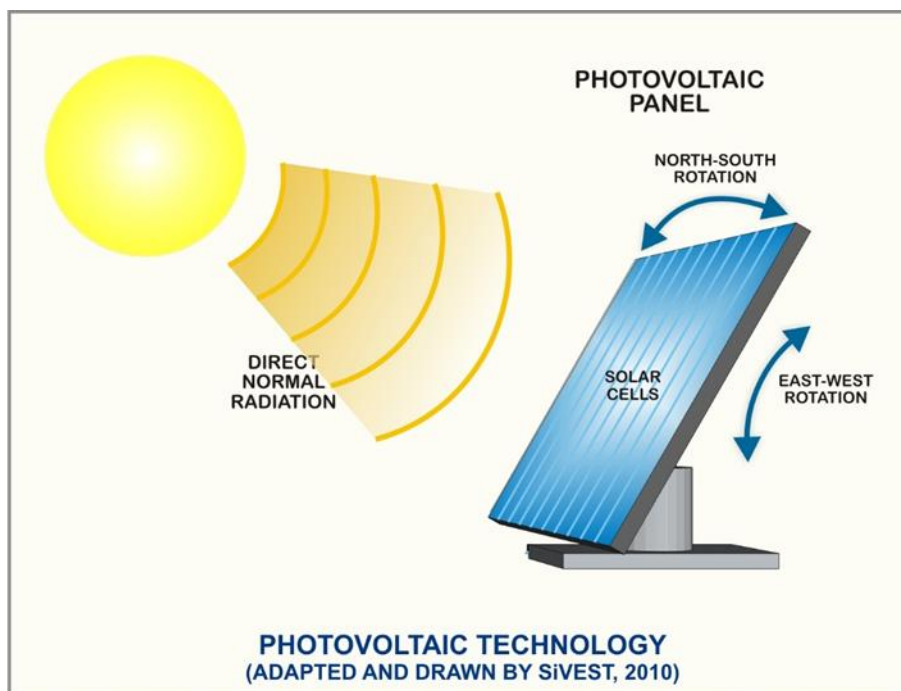
<sup>11</sup> Originally formed part of Umsobomvu WEF (14/12/16/3/3/2/730) which was issued with an EA on 17 February 2017. EA however split into three (3) separate EAs, namely Umsobomvu I WEF (14/12/16/3/3/2/730/AM2), Coleskop WEF (14/12/16/3/3/2/730/1/AM2) and Eskom Infrastructure MTS (14/12/16/3/3/2/730/2) (which includes Eskom Hydra D MTS)



At this stage, it is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising multiple PV modules. Solar PV panels are usually arranged in rows consisting of a number of PV modules. The area required for the PV arrays will likely need to be entirely cleared or graded.

As mentioned, the proposed solar PV energy facility will have a maximum total generation capacity of up to approximately 400MW and would consist of up to approximately 1 371 429 PV modules, with each module occupying an area of approximately 2m<sup>2</sup>. The PV modules will be either fixed tilt mounting or single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology. Each PV module will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. The solar PV modules are variable in size and are dependent on advances in technology between project inception and project realisation. The actual size of the PV modules to be used will be determined in the final design stages of the proposed development. The PV modules are mounted on metal frames. Ramped piles are commonly used for the support of such structures.

The typical components of a solar PV panel are illustrated in **Figure 4** below.



**Figure 4:** Typical components of a solar PV Panel

### 3.2.2 On-site / Collector Substations

The proposed development will include the construction of one (1) new on-site substation and one (1) new collector substation, each occupying an area of up to approximately 4ha (total combined footprint of approximately 8ha). The substations will be step-up substations which will have a capacity of 33/132kV. In addition, the substations will include an Eskom portion and an IPP portion, hence the on-site and collector substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA to allow for handover to Eskom.

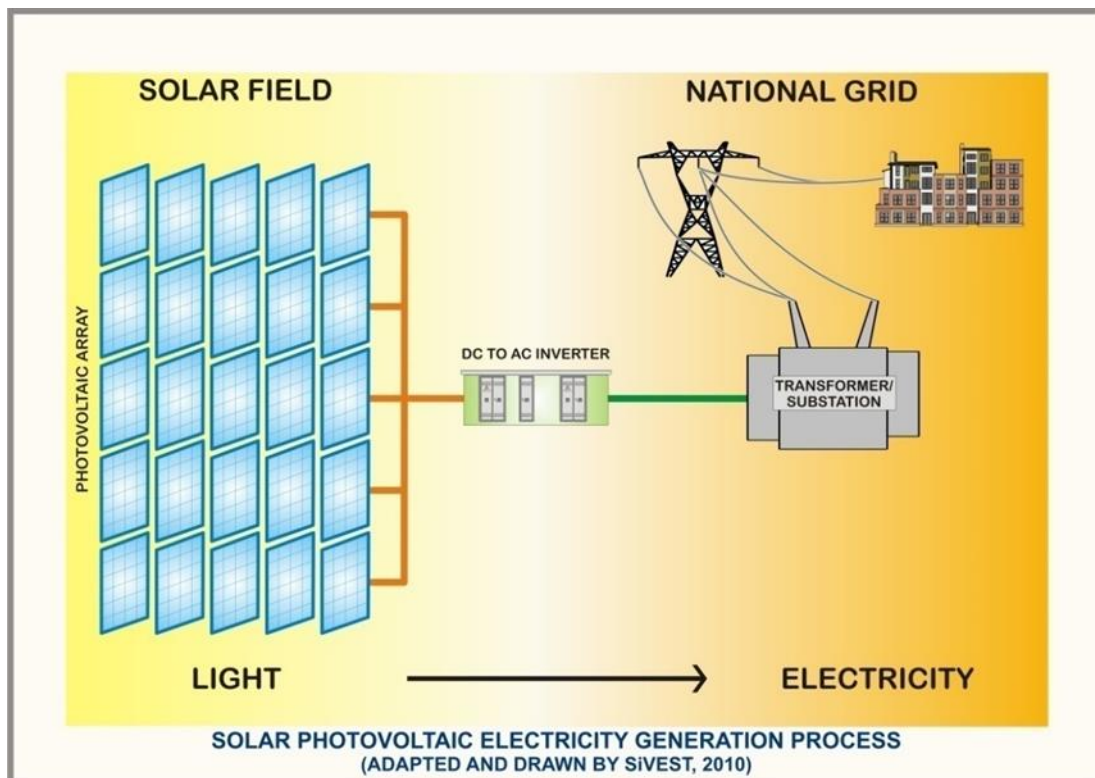
### 3.2.3 Underground Cabling

Medium voltage cabling will be utilised to link the proposed solar PV energy facility to the grid connection infrastructure (132kV overhead power line, on-site substations and collector substations). These cables will be laid underground wherever technically feasible.

### 3.2.4 Electrical Infrastructure

The solar arrays are usually connected in strings, which are in turn connected to inverters. Direct Current (DC) power from the panels will be converted into Alternating Current (AC) power in the inverters and the voltage will be typically stepped up to a medium voltage in the transformers. As mentioned, medium voltage cabling will link the solar PV energy facility to the grid connection infrastructure (132kV overhead power line and 33/132kV on-site and collector substations). The medium voltage cables will be run underground (wherever technically feasible) in the facility before being fed to the on-site and collector substation, where the voltage will typically be stepped up. An on-site overhead power line with a voltage capacity of 132kV will run from the on-site and/or collector substation to the proposed connection point at the Hydra D Main Transmission Substation (MTS), which will still be constructed (part of a separate BA process<sup>11</sup>), based on the preference for the overhead power line corridor route proposed as part of the electrical infrastructure BA (part of a separate on-going BA process with **DEFF Ref No.:** [14/12/16/3/3/1/2134](#)).

The solar PV electricity generation process is illustrated in **Figure 5** below.



## **Figure 5: Solar PV electricity generation process**

### *3.2.5 Roads*

Internal roads (up to 14m wide during construction and between 4m and 12m during operation) will provide access to the PV arrays. Existing site roads will be used wherever possible, although new internal site roads will be constructed where necessary. It should be noted that the internal roads which will be used during construction will be partly rehabilitated, where possible.

### *3.2.6 Temporary Infrastructure*

Temporary infrastructure in the form of construction laydown / staging areas will be required for the construction phase of the proposed development. Each proposed PV array area will require a temporary construction laydown / staging area. However, certain PV array areas will share laydown / staging areas. As such, up to a maximum of four (4) temporary construction laydown / staging areas of approximately 4ha each (total combined footprint of approximately 16ha) will be used during the construction phase. It should however be noted that it is unlikely that the applicant will make use of all of the authorised laydown / staging areas, as certain PV array areas may share laydown / staging areas (where possible). The applicant has requested that the maximum number of laydown / staging areas be authorised as a precaution, should all of these be required. The number of laydown / staging areas will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).

### *3.2.7 Other Associated Infrastructure*

Other infrastructure includes the following:

- Operation and maintenance (O&M) buildings will be required for each PV array area, each occupying a site of approximately 1ha. However, certain PV array areas will share O&M buildings. Four (4) O&M buildings are thus being proposed, with a total combined footprint of approximately 4ha. It should however be noted that it is unlikely that the applicant will construct all of the authorised O&M buildings, as certain PV array areas may share O&M buildings (where possible). The applicant has requested that the maximum number of O&M buildings be authorised as a precaution, should all of these be required. The number of O&M buildings will be refined (if required) prior to the final layout plan being submitted to the Department for approval (prior to construction commencing).

### *3.2.8 Future Plans for Site and Infrastructure After Decommissioning*

Should the proposed development's PPA not be renewed at the end of the operational phase of the proposed development, the proposed development might need to be decommissioned. This would

include the decommissioning of the medium voltage lines connecting the PV array areas to the substations as well as the overhead lines connecting the substations to the grid (i.e. the 132kV overhead power lines) which are associated with the proposed development. Should the proposed development need to be decommissioned, the applicant will rehabilitate the project site as per the requirements in the NEMA Regulations, following the decommissioning of the project site. The aim of the decommissioning phase would be to return the site to its original pre-construction condition. In the unlikely event that decommissioning is required (i.e. PPA not renewed, facility becoming outdated or the land being required for other purposes), the decommissioning phase will be undertaken in line with the EMPr and the requirements in the NEMA Regulations, and the site will be rehabilitated to its original pre-construction condition.

However, should the applicant negotiate and sign a further PPA, the applicant will re-energise or re-power (re-design and re-fit proposed development to operate for a longer period) the project site. In addition, if needed, the applicant will look into the possibility of upgrading the infrastructure to more advanced technologies. It should be noted that the probability of upgrading the infrastructure is quite high should the applicant re-energise or re-power the project site.

Majority of the components of the solar PV energy facility are considered to be reusable or recyclable. In the event of the proposed development being decommissioned, the components will be reused, recycled or disposed of (where possible) in accordance with the relevant regulatory requirements. Certain PV components may also be traded or sold as there is an active second-hand market for certain PV components. Alternatively, in the event that sale is not possible, certain PV components may be used as scrap metal. It must be noted that the decommissioning phase of the proposed development will also create skilled and unskilled employment opportunities.

### **3.3 Alternatives**

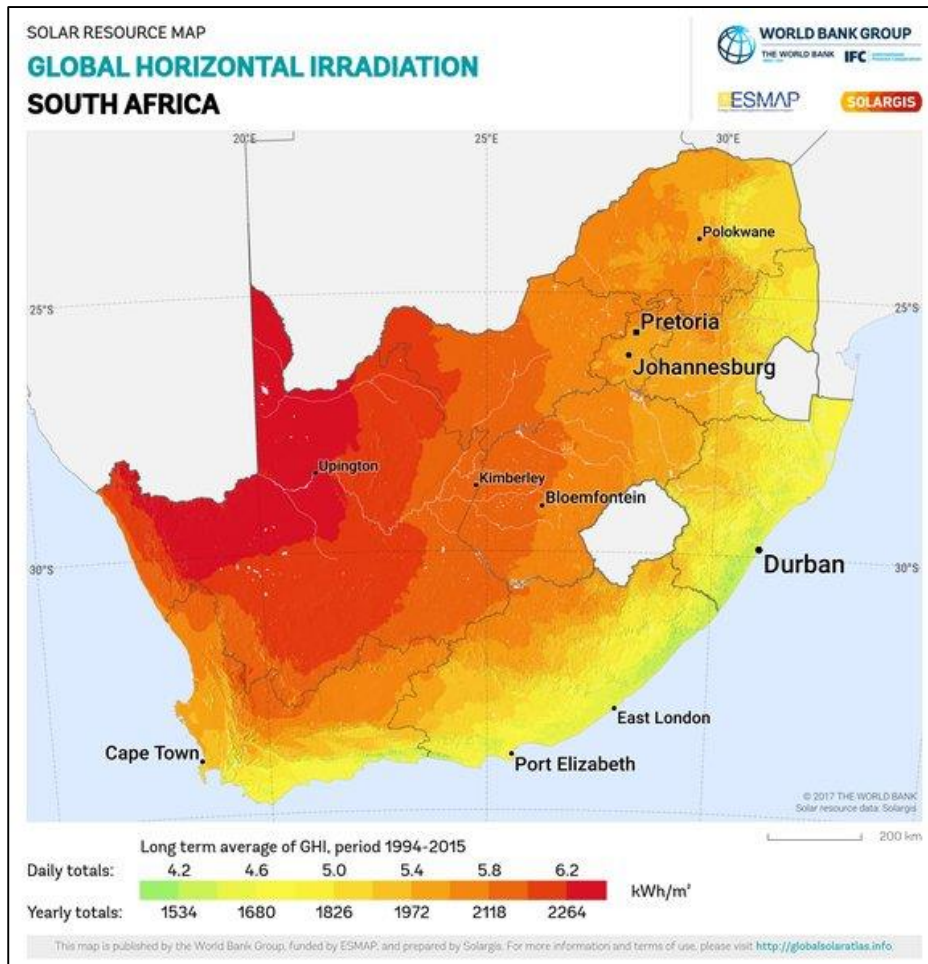
As per the 2014 EIA Regulations (as amended), feasible and reasonable alternatives are required to be considered during the EIA process. Alternatives are defined in Chapter 1 of the 2014 EIA Regulations (as amended) as “*different means of meeting the general purpose and requirements of the activity*”. These alternatives may include:

- (a) The property on which or location where it is proposed to undertake the activity;
- (b) The type of activity to be undertaken;
- (c) The design or layout of the activity;
- (d) The technology to be used in the activity;
- (e) The operational aspects of the activity; and
- (f) The option of not implementing the activity.

Each of the alternatives in relation to the proposed development is discussed in the sections below.

#### *3.3.1 The properties on which or location where it is proposed to undertake the activity*

No site alternatives for this proposed development are being considered as the placement of solar PV installations is dependent on several factors, all of which are favourable at the proposed site location. These include solar resource, climate, topography, grid connections and access to the site. The project site has been identified through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects. The Northern Cape Province in South Africa has favourable solar irradiation potential. The project site receives an annual Global Horizontal Irradiation (GHI) ranging from approximately 1972 to 2264kWh/m<sup>2</sup>/year (**Figure 6**).



**Figure 6:** Global Horizontal Irradiation (GHI) map (Source - 2017 The World Bank, Solar resource data: SolarGis)

The project site will have access to the national grid via the Hydra D MTS or the proposed Coleskop WEF substation (depending on which option is chosen as 'preferred'), both of which will still be constructed. There are two (2) operational projects which are located within a 35km radius of the proposed site, namely the Linde SEF and Noupoot Wind Farm, in addition to several other renewable energy developments which are being proposed or have already received approval. The project site has a relatively flat topography which is suitable for the development of a solar PV energy facility. The project site is easily accessible via an existing dirt secondary road which connects to the tarred N10 national road. The proposed site is therefore considered highly suitable for the proposed development and no other locations are being considered.

### 3.3.2 *The type of activity to be undertaken*

No other activity alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Based on the relatively flat terrain, the climatic conditions and current land-use being agricultural, it was determined that the proposed site would be best suited for a solar PV energy facility, instead of any other type of renewable energy technology. The proposed site was selected due to the terrain being in the lower flat areas, instead of the adjacent mountainous areas. Wind energy installations are not feasible on the site as it is generally preferred to install wind energy facilities on elevated ground. In addition, concentrated solar power (CSP) installations are not feasible because they have a high water requirement and the project site is located in an arid area. There is also not enough rainfall in the area to justify a hydro-electric plant. Therefore, no technology alternatives are feasible for assessment at this stage of the proposed development other than a solar PV energy facility.

One (1) type of activity is therefore considered (namely a solar PV energy facility) in order to generate energy from a renewable source of energy, solar energy.

### 3.3.3 *The design or layout of the activity*

**Design or layout alternatives are being considered and assessed as part of the EIA phase.** These include alternative locations for the laydown / staging areas and O&M buildings<sup>12</sup>. These were informed by the identified environmental sensitive areas as various environmental specialists assessed the application site during the scoping phase. The identified sensitive areas were used during the EIA phase to perform a comparison of layout alternatives. The results of the comparative assessment of layout alternatives are summarised in **section 8.2**.

In addition, three (3) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have also been comparatively assessed by the respective specialists. These alternatives essentially provide for three (3) different route alignments with associated substations (on-site and collector) contained within an assessment corridor between approximately 400m and 900m wide. This is to allow for flexibility to route the power line on either side of the existing high voltage Eskom power lines. It should be noted that the substation sites included as part of this application are intrinsically linked to the associated electrical infrastructure project (part of a separate BA process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process

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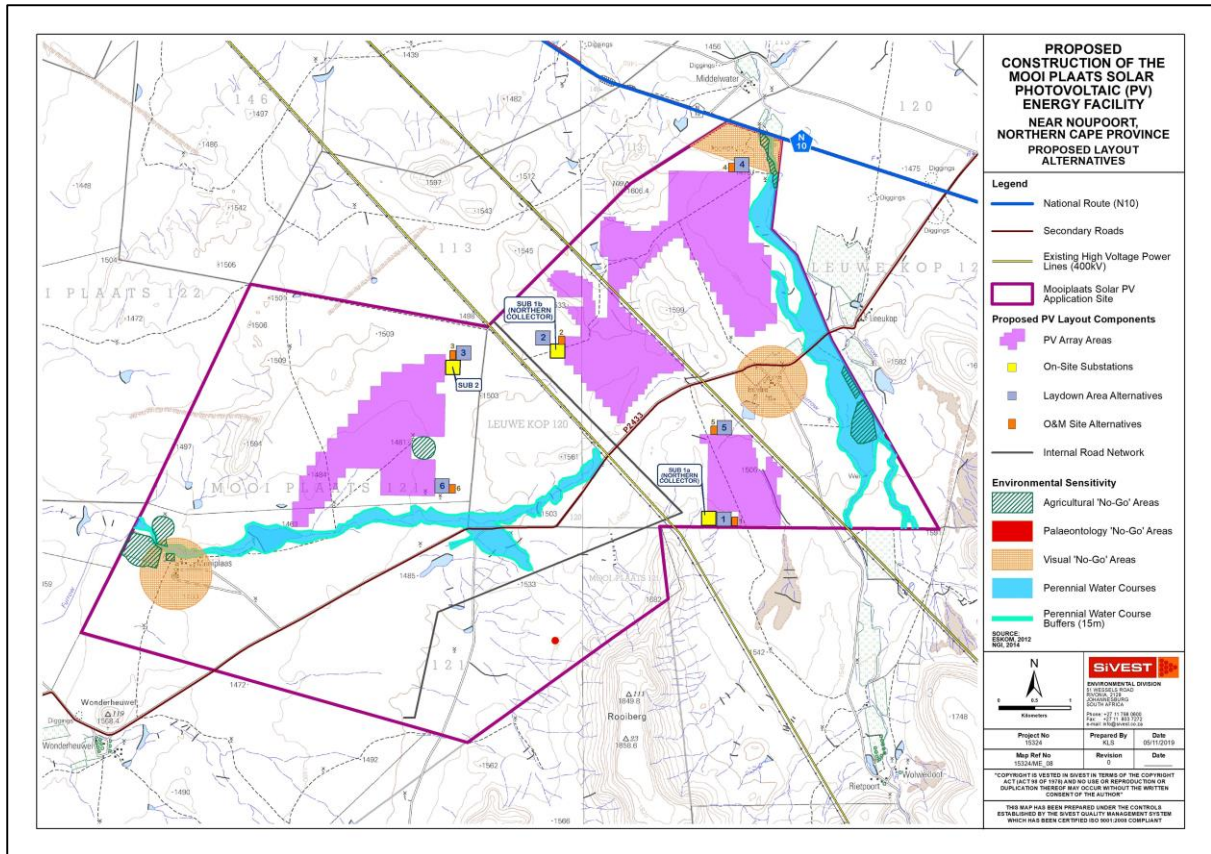
<sup>12</sup> Although the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process with **DEFF Ref No.: 14/12/16/3/3/1/2134**), the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the substation sites proposed as part of this EIA application. As such, the results of the comparative assessment of grid connection infrastructure alternatives have been provided in this report to provide information regarding the substations proposed as part of this EIA application

with **DEFF Ref No.:** 14/12/16/3/3/1/2134). The results of the comparative assessment of grid connection infrastructure alternatives have however been provided in this report as the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the on-site and collector substation sites being proposed as part of this EIA application. The results of the comparative assessment of grid connection infrastructure alternatives are summarised in **section 8.2**.

It should be noted that prior to the submission of the DSR, a preliminary PV development area was considered by the applicant. However, in order to ensure that the proposed development avoids the sensitive areas identified by the specialists, the preliminary PV development area was subsequently amended. In addition, the proposed PV development area was further refined following the submission of the DSR and prior to the submission of the FSR. During the scoping phase the preliminary PV development area was comparatively assessed with the proposed PV development area, which was informed by the identified sensitive areas and presented in the scoping phase, in order to confirm that it would be 'preferred' from an environmental perspective. Based on the results of the comparative assessment of the above-mentioned PV development areas, it was concluded that the proposed refined PV development area which was presented in the scoping phase was preferred from an environmental perspective when compared to the preliminary PV development area. In addition, the proposed PV development area that was presented in the DSR and FSR was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure alternatives which were investigated and comparatively assessed in the EIA phase. The results of the comparative assessment of the PV development areas is provided in **section 8.1**.

The proposed PV array areas and layout alternatives in relation to the identified environmental sensitive areas are presented in **Figure 7** below.





**Figure 7:** Proposed PV array areas and layout alternatives for associated infrastructure in relation to environmental sensitive areas

As mentioned, the alternative site locations for the layout alternatives were informed by the identified environmental sensitive areas. The EIA phase layout alternatives, including maps, are presented in **section 8.2**. The selected preferred layout alternatives will be based on both environmental constraints and design factors.

### 3.3.4 The technology to be used in the activity

There are very few technological alternatives for PV technology. For the Wonderheuvvel Solar PV Energy Facility the PV modules will be either fixed-tilt mounting or single-axis tracking mounting, and the modules will be either crystalline silicon or thin-film technology. Each module will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. The impacts on the environment of the different types of PV technology are the same during construction, operation and decommissioning. Therefore, no technology alternatives will be considered during the EIA process. The choice of technology used will ultimately be determined by technological and economic factors at a later stage.



### 3.3.5 *The operational aspects of the activity*

No operational alternatives were assessed in the EIA, as none are available for solar PV installations.

### 3.3.6 *'No-go' alternative*

The 'No-go' alternative is the option of not implementing the proposed development. Should the proposed development not be implemented, the current agricultural land uses would continue including rural agriculture (small stock grazing) and limited tourism.

On a regional scale, the 'No-go' alternative is also not preferred. Renewable energy facilities are key to the success of South Africa's plan to build resilience against climate change. South Africa currently relies almost completely on fossil fuels as a primary energy source (approximately 90%). Coal combustion in South Africa is the main contributor to carbon dioxide emissions, which is one (1) of the main greenhouse gasses that has been linked to climate change. With the global focus on climate change, the government is under pressure to explore alternative energy sources in addition to coal-fired power stations.

An emphasis has therefore been placed on securing South Africa's future power supply through the diversification of power generation sources. Furthermore, South Africa would have to invest in a power generation mix, and not solely rely on coal-fired power generation, to honour its commitments made under the Copenhagen Accord and subsequent Paris Agreement (ratified during November 2016) to mitigate climate change challenges. Under the Paris Agreement, the country committed to working towards the goal of holding the increase in global average temperature to well below 2 degrees Celsius and pursuing efforts to limit the global temperature increase to 1.5 degrees Celsius.

The DEFF acknowledges the risks posed to South Africa by climate change confirming that '*South Africa has been experiencing the severe effects of drought conditions catalysed by the worst El Nino event in decades. The rising sea temperatures in the Pacific Ocean that resulted in increased temperatures and reduced rainfall in many parts of the world, was exacerbated by rising global temperatures associated with climate change. South African scientists and weather forecasters warn that this is what can be expected in the decades to come, if ambitious global action is not taken urgently to reduce the concentration of greenhouse gases in the atmosphere*' (DEFF, 2016b).

The current South African plan to achieve the goal set under the Paris Agreement, is rated as Highly Insufficient due to an unresolved strategy to secure a 'just transition' from coal to renewables, successfully and timeously implement a carbon tax and update the Integrated Resource Plan (Refer to **section 3.3.2** for more information). In December 2011, Climate Action Tracker rated South Africa's plan as Medium as at the time we committed to increasing renewable energy to enable our emissions to peak between 2020 and 2025. Based on the dismal performance to date downgrading our climate action plan from medium to highly insufficient, it is clear that the trajectory South Africa is on is insufficient to reach the goals set to avoid catastrophic climate change.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel-based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports in the country.

Although solar power is not the only solution to solving the energy crisis in South Africa, not establishing the proposed solar PV energy facility and associated infrastructure would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This proposed development will aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation. It is a suitable sustainable solution to the energy crisis and this proposed development could contribute to addressing the problem. This proposed development will aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

From a social perspective, the 'No-go' option would mean that the social environment is not affected as the status quo would remain. On a negative front it would also mean that all the positive aspects associated with the proposed development would not materialise. Consequently, there would be no job creation, no revenue streams into the local economy and municipal coffers and a lost opportunity to enhance the national grid with a renewable source of energy. Considering that Eskom's coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not at a global level. The Intergovernmental Panel on Climate Change (6 October 2018, p. 15) has warned that that CO<sub>2</sub> emissions need to be reduced by 45% from 2010 levels by 2030 and to zero by 2050, which basically means that coal must go.

From an avifaunal perspective, the 'No-go' alternative will result in the current status quo being maintained as far as the avifauna is concerned. The low human population in the area is definitely advantageous to avifauna. The 'no-go' option would therefore eliminate any additional impact on the ecological integrity of the proposed development area as far as avifauna is concerned.

From a terrestrial ecology perspective, the no-development alternative option assumes the site remains in its current state, i.e. there is no construction of a solar PV energy facility and associated infrastructure in the proposed project area and the status quo would prevail.

The 'No-go' option is a feasible option, however, this would prevent the proposed development from contributing to the significant environmental, social and economic benefits associated with the development of the renewables sector.

## 4 LEGAL REQUIREMENTS AND GUIDELINES

### 4.1 Key Legal and Administrative Requirements Relating to the Proposed Development

#### 4.1.1 Constitution of South Africa

The Constitution of South Africa (No. 108 of 1996) provides environmental rights and includes implications for environmental management. Section 24 of the Constitution states that:

*'Everyone has the right –*

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

The Constitution is the overarching legislation for South Africa. Although it provides for certain rights and obligations, the NEMA has been promulgated in order to manage the various spheres of both the social and natural environment.

#### 4.1.2 National Environmental Management Act (NEMA) (Act No. 107 of 1998) – NEMA EIA Requirements

The National Environmental Management Act (NEMA) (Act No. 107 of 1998) was promulgated in 1998 but has since been amended on several occasions from this date. This Act replaces parts of the Environment Conservation Act (ECA) (Act No. 73 of 1989) with exception to certain parts pertaining to Integrated Environmental Management.

The Act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;
- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment; and
- to provide for matters connected therewith.

The NEMA is the overarching legislation which governs the EIA process and environmental management in South Africa. Sections 24 and 44 of the NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA. Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation. Comprehensive lists of such activities were gazetted and it the proposed Wonderheuvvel Solar PV Energy Facility triggers activities from all three (3) listing notices (namely GN

R. 324, 325 and 327 as published on 7 April 2017) gazetted on 7 April 2017 (Government Gazette 326) (the “EIA Regulations”).

Therefore, a full EIA process is required for the proposed development in terms of Section 21 to 24 of the 2014 EIA Regulations (as amended).

#### 4.1.3 NEMA EIA Regulations, 2014 (as amended)

In terms of these Regulations, a full EIA is required for the proposed development based on triggered activities. However, several activities which trigger a BA were also identified and also need to be specified. Ultimately, these activities will not form a separate assessment, but will fall into the greater EIA.

The following Schedules of the Government Notice No. R. 983, 984 and 985 of 4 December 2014 (as amended) are of relevance to the proposed development in question. All of the Listed Activities identified in terms of Sections 24(2) and 24D include:

**Table 8:** Listed activities in terms of the NEMA Regulations

<b>Activity No(s):</b>	<b>Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R. 983) (as amended)</b>	<b>Describe the portion of the proposed project to which the applicable listed activity relates.</b>
11 (i)	<p><b>GN R. 983 Item 11:</b> <i>The development of facilities or infrastructure for the transmission and distribution of electricity—</i></p> <p><i>(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.</i></p>	<p><b>New on-site substations and collector substations will be constructed as part of the proposed development. The proposed substations will be located outside an urban area and will have a capacity of 33/132 kilovolts (kV). In addition, the substations will likely each occupy a footprint of approximately 4ha.</b></p>
12 (ii) (a) (c)	<p><b>GN R. 983 Item 12:</b> <i>The development of:</i></p> <p><i>ii) infrastructure or structures with a physical footprint of 100 square metres or more;</i></p> <p><i>where such development occurs-</i></p> <p><i>(a) within a watercourse;</i></p> <p><i>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</i></p>	<p><b>The proposed Solar PV Energy Facility will likely entail the construction of buildings and other infrastructure with a physical footprint of approximately 2 500m<sup>2</sup> (50m x 50m). The Solar PV infrastructure will likely avoid the identified surface water features where possible, although some structures may occur within a watercourse and/or within 32m of a watercourse.</b></p>
19	<p><b>GN R. 983 Item 19:</b> <i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i></p>	<p><b>The surface water impact assessment revealed that there are surface water features located within the application site. The proposed development will thus likely involve the excavation, removal, infilling, depositing and moving of more than 10m<sup>3</sup> of soil, sand,</b></p>

		<p>pebbles or rock from some of the identified watercourses.</p> <p>Although the layout of the proposed development will be designed to avoid the identified surface water features / watercourses as far as possible, some of the internal and access roads may need to traverse the identified surface water features and during construction of these roads, soil may need to be removed from some of the identified watercourses.</p>
24 (ii)	<p><b>GN R. 983 Item 24:</b> <i>The development of a road –</i></p> <p><i>ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;</i></p>	<p>Internal access roads will be required to access the PV panels and substations. It is proposed that these internal access roads will be between 4m and 12m wide. Existing roads will be used wherever possible, although new roads will be constructed where necessary.</p>
28 (ii)	<p><b>GN R. 983 Item 28:</b> <i>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></p> <p><i>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</i></p>	<p>The proposed development site is currently used and zoned for agricultural purposes and will result in special zoning being required, as an area greater than 1ha will likely be transformed into industrial / commercial use.</p>
Activity 31 (i)	<p><b>GN R. 983 Item 31:</b> <i>The decommissioning of existing facilities, structures or infrastructure for -</i></p> <p><i>(i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;</i></p>	<p>Should the proposed development's Power Purchase Agreement (PPA) not be renewed after 20 years (anticipated operational lifespan of proposed development), the proposed development might need to be decommissioned. This would include the decommissioning of the medium voltage lines connecting the PV array areas to the substations as well as the overhead lines connecting the substations to the grid (i.e. the 132kV overhead power lines) which are associated with the proposed development.</p>
Activity 48 (i) (a) (c)	<p><b>GN R. 983 Item 48:</b> <i>The expansion of</i></p> <p><i>(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;</i></p>	<p>The proposed development will most likely entail the expansion (upgrading) of roads and other infrastructure by 100m<sup>2</sup> or more within a watercourse or within 32m from the edge of a watercourse.</p>

	<p>where such expansion occurs—</p> <p>(a) within a watercourse; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</p>	<p>Although the layout of the proposed development will be designed to avoid the identified surface water features / watercourses as far as possible, some of the internal and access roads to be upgraded will likely need to traverse the identified surface water features and construction will likely occur within some of the watercourses and/or be within 32m of some of the watercourses.</p>
56 (ii)	<p><b>GN R. 983 Item 56:</b> <i>The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -</i></p> <p>(ii) where no reserve exists, where the existing road is wider than 8 metres –</p>	<p>As mentioned, internal access roads will be required to access the PV panels and the substations. Existing roads will be used wherever possible, although new roads will be constructed where necessary. The existing access roads might thus need to be upgraded by widening them more than 6m, or by lengthening them by more than 1km.</p>
<b>Activity No(s):</b>	<b>Provide the relevant Scoping and EIR Activity(ies) as set out in Listing Notice 2 (GN R. 984) (as amended)</b>	<b>Describe the portion of the proposed project to which the applicable listed activity relates.</b>
1	<p><b>GN R. 984 Item 1:</b> <i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,</i></p>	<p>The proposed development will entail the development of a Solar PV Energy Facility where the electricity output will be 20MW or more. The proposed development will be located outside an urban area.</p>
15 (i) (ii)	<p><b>GN R. 984 Item 15:</b> <i>The clearance of an area of 20 hectares or more of indigenous vegetation</i></p>	<p>The proposed solar PV development will involve the clearance of more than 20ha of indigenous vegetation. Clearance will also be required for the proposed substations, internal access roads and other associated infrastructure.</p> <p>An ecology impact assessment was undertaken to assess the impacts of the proposed development on vegetation (Appendix 6).</p>
<b>Activity No(s):</b>	<b>Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 (GN R. 985) (as amended)</b>	<b>Describe the portion of the proposed project to which the applicable listed activity relates.</b>
<b>Activity 4 g. ii. (ee)</b>	<p><b>GN R. 985 Item 4:</b> <i>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</i></p> <p><b>g. Northern Cape</b></p> <p><i>ii. Outside urban areas:</i></p>	<p>Internal access roads will be required to access the PV panels and the substations. It is proposed that these internal access roads will be between 4m and 12m wide. Existing roads will be used wherever possible, although new</p>

	<p>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p>	<p>roads will be constructed where necessary. These roads will occur within the Northern Cape Province, outside an urban area and the application site contains Critical Biodiversity Areas (CBAs). Refer to the CBA map attached in Appendix 5.</p>
<p><b>Activity 12</b> <b>g. ii.</b></p>	<p><b>GN R. 985 Item 12:</b> <i>The clearance of an area of 300 square meters or more of indigenous vegetation</i></p> <p><b>g. Northern Cape</b> <i>ii. Within critical biodiversity areas identified in bioregional plans;</i></p>	<p>The proposed solar PV development will likely transform more than 300m<sup>2</sup> of indigenous vegetation. Clearance will also be required for the proposed substations, internal access roads and other associated infrastructure. Clearance will occur within a CBA. Refer to the CBA map attached in Appendix 5.</p> <p>An ecological impact assessment has been undertaken to assess the impacts of this infrastructure on the indigenous vegetation, as well as the CBAs.</p>
<p><b>Activity 14</b> <b>(ii) (a) (c);</b> <b>g. ii. (ff)</b></p>	<p><b>GN R. 985 Item 14:</b> <i>The development of - (ii) infrastructure or structures with a physical footprint of 10 square metres or more;</i></p> <p><i>where such development occurs –</i> <i>(a) within a watercourse;</i> <i>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</i></p> <p><b>g. Northern Cape</b> <i>ii. Outside urban areas:</i> <i>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i></p>	<p>The proposed solar PV energy facility will likely entail the development of roads and other infrastructure with a physical footprint of 10m<sup>2</sup> or more within a watercourse or within 32m from the edge of a watercourse.</p> <p>Although the layout of the proposed development will be designed to avoid the identified surface water features as far as possible, some of the internal and access roads, will likely need to traverse the identified surface water features.</p> <p>The development of the infrastructure will occur within CBAs and this will be located outside an urban area. Refer to the CBA map attached in Appendix 5.</p> <p>An ecological impact assessment was undertaken to assess the impacts of this infrastructure on the indigenous vegetation, as well as the CBAs, and is included in the FSR (Appendix 6).</p>
<p><b>Activity 18</b> <b>g. ii. (ee)</b> <b>(ii)</b></p>	<p><b>GN R. 985 Item 18:</b> <i>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre-</i></p> <p><b>g. Northern Cape</b></p>	<p>As mentioned, internal access roads will be required to access the PV panels and the substations. Existing roads will be used wherever possible, although new roads will be constructed where</p>

	<p><i>ii. Outside urban areas:</i>  <i>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i>  <i>(ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland;</i></p>	<p>necessary. It is likely that existing access roads will need to be upgraded. Internal access roads will likely be widened by more than 4m, or lengthened by more than 1km. These roads will occur within the Northern Cape Province, outside an urban area. In addition, this widening of the roads will occur within CBAs, and may also occur within a watercourse and/or within 100m from the edge of a watercourse.</p> <p>An ecological impact assessment (Appendix 6) was undertaken to assesses the impacts of this infrastructure on the CBAs. In addition, a surface water impact assessment (Appendix 6) was undertaken to assesses the impacts of this infrastructure on the identified watercourses.</p>
<p><b>Activity 23</b>  <b>(ii) (a) (c);</b>  <b>g. ii. (ee)</b></p>	<p><b>GN R. 985 Item 23:</b> <i>The expansion of –</i>  <i>(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;</i>  <i>where such expansion occurs –</i></p> <p><i>(a) within a watercourse;</i>  <i>(b) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</i></p> <p><b>g. Northern Cape</b>  <i>ii. Outside urban areas:</i>  <i>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i></p>	<p>The proposed development will likely entail the development and expansion of roads and other infrastructure by 10m<sup>2</sup> or more within a watercourse or within 32m from the edge of a watercourse.</p> <p>Although the layout of the proposed development will be designed to avoid the identified surface water features as far as possible, some of the existing internal and access roads may likely need to traverse some of the identified surface water features.</p> <p>The proposed development occurs within CBAs, and is located outside an urban area.</p> <p>An ecological impact assessment (Appendix 6) was undertaken to assesses the impacts of the proposed development on CBAs. In addition, a surface water impact assessment (Appendix 6) was undertaken to assesses the impacts of the proposed development on the identified surface water features.</p>



#### 4.1.4 *Environmental Impact Assessment (EIA) Guideline for Renewable Energy Projects, DEFF Notice 989 of 2015*

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector. The guideline is principally intended for use by the following stakeholder groups:

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

This guideline seeks to identify activities requiring authorisation prior to commencement of that activity and provide an interface between national EIA regulations and other legislative requirements of various authorities.

The guidelines are applicable for the construction, installation and/or development of the following renewable energy projects:

- Concentrating Solar Power (CSP) Plant;
- Wind Energy Facility;
- Hydropower Station; and
- Photovoltaic (PV) Power Plant.

As the proposed development is for a solar PV energy facility, it is subject to the recommendations proposed in the guidelines.

#### 4.1.5 *National Energy Act (Act No. 34 of 2008)*

South Africa has two (2) acts that direct the planning and development of the country's electricity sector, namely:

- i. The National Energy Act of 2008 (Act No. 34 of 2008); and
- ii. The Electricity Regulation Act (ERA) of 2006 (Act No. 4 of 2006) (see **section 4.1.6**).

The National Energy Act (Act No. 34 of 2008), promulgated in 2008, has, as one (1) of its key objectives, the promotion of diversity of supply of energy and its sources. From this standpoint, the Act directly references the importance of the RE sector, with a mention of the solar energy sector included. The aim is to ensure that the South African economy is able to grow and develop, fast-tracking poverty alleviation, through the availability of a sustainable, diverse energy mix. Moreover, the goal is to provide for the increased generation and consumption of RE (Republic of South Africa, 2008).

#### 4.1.6 *Electricity Regulation Act (Act No. 4 of 2006)*

In 2011, the electricity regulation on new generation capacity was published under Section 35(4) of the Electricity Regulation Act (ERA) (Act No. 4 of 2006). These regulations apply to the procurement of new generation capacity by organs of state.

The objectives of the regulations include:

- To facilitate planning for the establishment of new generation capacity;
- The regulation of entry by a buyer and a generator into a Power Purchase Agreement (PPA);
- To set minimum standards or requirements for PPAs;
- The facilitation of the full recovery by the buyer of all costs efficiently incurred by it under, or in connection with, a PPA including a reasonable return based on the risks assumed by the buyer thereunder and to ensure transparency and cost reflectivity in the determination of electricity tariffs; and
- The provision of a framework for implementation of an IPP procurement programme and the relevant agreements concluded.

The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

#### 4.1.7 *National Heritage Resources Act (NHRA) (Act No. 25 of 1999)*

This Act requires investigation to determine the impact of heritage resources when developments exceed the thresholds listed in section 38(1) of the act:

- (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- (b) the construction of a bridge or similar structure exceeding 50m in length;
- (c) any development or other activity which will change the character of a site—
  - (i) exceeding 5000m<sup>2</sup> in extent; or
  - (ii) involving three (3) or more existing erven or subdivisions thereof; or
  - (iii) involving three (3) or more erven or divisions thereof which have been consolidated within the past five (5) years; or
  - (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- (d) the re-zoning of a site exceeding 10000m<sup>2</sup> in extent; or
- (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

The proposed development would involve; (a) the construction of linear infrastructure exceeding 300m in length, (c) the development of a solar PV energy facility that will change the character of more than 0.5ha, three (3) erven and (d) the rezoning of a site that will exceed 1ha.

The law ensures community participation in the protection of national heritage resources and will involve all three (3) levels of government in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole.

A Heritage Impact Assessment (**Appendix 6D**) has been conducted to explore how the proposed development may impact on heritage resources as protected by the Act. It should be noted that the Heritage Impact Assessment was originally undertaken via desktop means, however, following the desktop assessment, it was identified that further field truthing would need to be undertaken through an archaeological walk down. The aim of this was to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMP. This field truthing exercise was subsequently undertaken in August 2019 and the results have been incorporated into this FEIAR, as well as the updated Heritage Impact Assessment Report.

In addition, SAHRA are being consulted throughout the EIA process in order to obtain comments on the proposed development from a heritage perspective. All comments received from SAHRA throughout the EIA process are provided in **Appendix 7D**.

#### 4.1.8 National Water Act (NWA) (Act No. 36 of 1998, as amended)

The National Water Act (NWA) (Act No. 36 of 1998), as amended, was promulgated on the 20<sup>th</sup> of August 1998. This Act was created in order to ensure the protection and sustainable use of water resources (including wetlands) in South Africa. This Act is important in that it provides a framework to protect water resources against over-exploitation and to ensure that there is water for socio-economic and economic development, human needs and to meet the needs of the aquatic environment. The Act also recognises that water belongs to the whole nation for the benefit of all people.

It is important to note that water resources (including wetlands) are protected under the Act. Under the NWA, a 'water resource' includes a watercourse, surface water, estuary, or aquifer. Specifically, a watercourse is defined as (*inter alia*):

- A river or spring;
- A natural channel in which water flows regularly or intermittently; and
- A wetland, lake or dam into which, or from which, water flows.

One (1) of the main aims of the Act is the protection of water resources. 'Protection' in relation to a water resource entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource; and

- The rehabilitation of the water resource.

In the context of the proposed development and any potential impact on water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act, is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare of human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

This definition of pollution is quite wide-ranging, and it applies to all types of water resource. The inclusion of physical properties of a water resource within the definition of pollution entails that any physical alterations to a water body (for example, the excavation of a wetland or changes to the morphology of a water body) can be considered to be pollution. Activities which cause alteration of the biological properties of a watercourse (i.e. the fauna and flora contained within that watercourse) are also considered pollution.

In terms of section 19 of the Act, owners / managers / people occupying land on which any activity or process undertaken which causes / or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include measures to (*inter alia*):

- measures to cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- remedy the effects of any disturbance to the bed and banks of a watercourse.

From a licensing perspective, according to the NWA, the following are considered 'water uses' and will require a water use license application (WULA):

- a) Taking water from a water resource;
- b) Storing water;
- c) Impeding or diverting the flow of water in a watercourse;
- d) Engaging in stream flow reduction activity contemplated in Section 36 of the NWA;
- e) Engaging in a controlled activity identified as such in Section 37 (1) or declared under Section 38(1) of the NWA;
- 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 of waste in a 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 efficient continuation of an activity or for the safety of people; and

- k) Using water for recreational purposes.

In light of the above, there are a number of stipulations within the NWA that are relevant to the potential impacts on rivers, streams and wetlands that may be associated with the proposed development. A Surface Water Impact Assessment (**Appendix 6G**) has however been conducted to explore how the proposed development may impact on identified water resources as protected by the Act.

#### 4.1.9 National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004, as amended)

The overarching aim of the National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004), within the framework of the NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

In terms of this Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations);
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity; and
- Limit further loss of biodiversity and conserve endangered ecosystems.

The South African National Biodiversity Institute (SANBI) was established in terms of the NEM:BA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

The NEM:BA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a 'restricted activity' involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the Act. According to Section 57 of the Act, 'Restricted activities involving listed threatened or protected species':

- A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are 'of a nature that may negatively impact on the survival of a listed threatened or protected species'. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

The NEM:BA is relevant to the proposed development as the construction of the solar PV energy facility and other components (such as the substations and O&M buildings) may impact negatively on biodiversity. Additionally, the proposed application site traverses a Critical Biodiversity Area (CBA) 1, CBA 2 and Ecological Support Area (ESA), and therefore the proposed development may impact negatively on these areas, if not avoided. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite the SANBI to provide commentary on any documentation resulting from the proposed development.

It should be noted that a Terrestrial Ecology Impact Assessment (**Appendix 6H**) has been undertaken to explore how the proposed development may impact on biodiversity as protected by the Act.

#### *4.1.10 National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended)*

The overarching aim of the National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended), within the framework of NEMA, is to:

- provide for the declaration and management of protected areas;
- provide for co-operative governance in the declaration and management of protected areas;
- affect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- provide for a representative network of protected areas on state land, private land and communal land;
- promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of protected areas, where appropriate; and
- provide for the continued existence of South African National Parks.

The proposed development falls **outside** of any formally protected areas and outside the areas earmarked as part of the National Protected Areas Expansion Strategy (NPAES).

#### *4.1.11 National Forests Act (NFA) (Act No. 84 of 1998)*

The National Forest Act (NFA) (Act No. 24 of 1998) was enacted to:

- Provide for the protection, management and utilisation of forests;
- The protection of certain plant and animal life;
- The regulation of trade in forest produce;
- The control and management of a national hiking way system and National Botanic Gardens.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or

removing any protected tree. The list of protected trees is currently contained in GN 908 of 21 November 2014. Licenses are issued by the Minister and are subject to periods and conditions as may be stipulated.

### **Protected Trees**

According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that '*no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister*'.

### **Forests**

Prohibits the destruction of indigenous trees in any natural forest without a licence.

The NFA is relevant to the proposed development as the removal and/or disturbance and/or clearance of indigenous vegetation will be required and a license in terms of the NFA may be required for this to be done.

It should be noted that the Ecologist confirmed that there are no plant species occurring on-site or likely to occur on-site that are protected according to the NEM:BA. There are however a number of plant species occurring on-site that are protected according to the Northern Cape Nature Conservation Act (Act No. 9 of 2009). It is also likely that additional protected species occur on a site that were not observed during the field survey. None of these are of conservation concern, but a permit is required from the Provincial authorities to destroy them. Lastly, it was confirmed that there are no protected tree species that are likely to occur in the study area.

#### *4.1.12 Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983)*

The Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) controls the utilisation of natural agricultural resources in South Africa. The Act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants.

The primary objective of the Act is to conserve natural agricultural resources by:

- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

Rehabilitation after disturbance to agricultural land is managed by this Act. The CARA is relevant to the proposed development as the construction of a solar PV energy facility as well as other components (such as the substations and O&M buildings) may impact on agricultural resources and vegetation on the site. The Act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

An Agricultural and Soils Impact Assessment (**Appendix 6A**) has been conducted to explore how the proposed development may impact on the agricultural production potential of the proposed site. According to this assessment, no application is required in terms of the CARA. The EIA process covers the required aspects of this.

#### *4.1.13 Subdivision of Agricultural Land Act (SALA) (Act No. 70 of 1970, as amended)*

The Subdivision of Agricultural Land Act (SALA) (Act No. 70 of 1970, as amended) controls the subdivision of all agricultural land in South Africa; prohibiting certain actions pertaining to agricultural land. Under the Act, the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land. This Act thus requires that an application for the solar PV development be approved by the Department of Agriculture, Forestry and Fisheries (DAFF). Despite the name of the Act, it does not apply only to subdivision, and its purpose is to ensure productive use of agriculturally zoned land. Therefore, even if land is not being subdivided or leased, the SALA approval is required to develop agriculturally zoned land for non-agricultural purposes.

The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. To achieve this purpose, the Act also regulates leasing and selling of agricultural land as well as registration of servitudes.

The Act is of relevance to the proposed development as any portion of land within the study area that is zoned for agricultural purposes that will need to be leased for a period exceeding ten (10) years, will be regulated by this Act. The Act 70 of 1970 consent is separate from the EIA and needs to be applied for and obtained after the EIA.

#### *4.1.14 National Road Traffic Act (NRTA) (Act No. 93 of 1996, as amended)*

The National Road Traffic Act (NRTA) (Act No. 93 of 1996, as amended) provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed solar PV energy facility.

#### *4.1.15 Civil Aviation Act (CAA) (Act No. 13 of 2009)*

The Civil Aviation Act (CAA) (Act No. 13 of 2009) controls and regulates aviation within South Africa. It provides for the establishment of a South African Civil Aviation Authority (SACAA) and independent Aviation Safety Investigation Board in compliance with Annexure 13 of the Chicago Convention. It gives effect to various conventions related to aircraft offences, civil aviation safety and security, and provides



for additional measures directed at more effective control of the safety and security of aircrafts, airports and matters connected thereto.

Although the Act is not directly relevant to the proposed development, it should be considered as the establishment of a solar PV energy facility may impact on aviation and air traffic safety if located directly within aircraft flight paths.

Air Traffic and Navigation Services Company Limited (ATNS) and the SACAA are being consulted throughout the EIA process and the required approvals will be obtained, where necessary.

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

The Northern Cape Nature Conservation Act (Act No. 9 of 2009) and the Nature and Environmental Conservation Ordinance 19 of 1974 are of relevance to the Northern Cape Province. These are developed to protect both animal and plant species within the province. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation.

Northern Cape Nature Conservation Act (Act No. 9 of 2009) provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:

- Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;
- Aquatic habitats may not be destroyed or damaged;
- The owner of the land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.

The Act provides lists of protected species for the Province. According to Northern Cape Nature Conservation officials, a permit is required for the removal of any species on this list.

As mentioned, the proposed application site traverses a CBA 1, CBA 2 and ESA, and therefore the proposed development may impact negatively on these areas. A Terrestrial Ecology Impact Assessment (**Appendix 6H**) has however been conducted to explore how the proposed development may impact on biodiversity as protected by the Act. In addition, the relevant provincial environmental authority (namely the Northern Cape Department of Environment and Nature Conservation – NC DENC) as well as the DEFF's Biodiversity Conservation Department are being consulted throughout the EIA process.

#### 4.1.17 Astronomy Geographic Advantage Act (Act No. 21 of 2007)

The Astronomy Geographic Advantage Act (Act No. 21 of 2007) provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy; and
- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected therewith.

Under Section 22(1) of the Act, the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central Astronomy Advantage Area (AAA). These activities include the construction, expansion or operation; of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

In terms of section 7(1) and 7(2) of this Act, national government established the following AAAs:

- Central Karoo AAA (GN 198 of 2014) – proposed development falls outside this AAA
- Sutherland Central AAA – proposed development falls outside this AAA
- Northern Cape AAA (GN 115 of 2010) – proposed development falls outside of this AAA

It should be noted that the proposed development is located approximately 145km from the nearest Central Karoo AAA. In addition, the Sutherland Central AAA only applies to areas within 75km of the Sutherland Observatory (situated in the town of Sutherland) and will not be affected as the proposed development is located almost 400km from the town of Sutherland.

Due to the fact that the proposed development is not situated within any of the established AAAs, the Astronomy Geographic Advantage Act is not relevant. The relevant authorities, including the Square Kilometre Array (SKA), will however be consulted throughout the EIA process and attempts will be made to obtain comments from these authorities with regards to the acceptability of the proposed development. Any correspondence received from these authorities will be included throughout the Scoping and EIA phases (see C&RR attached as **Appendix 7E**).

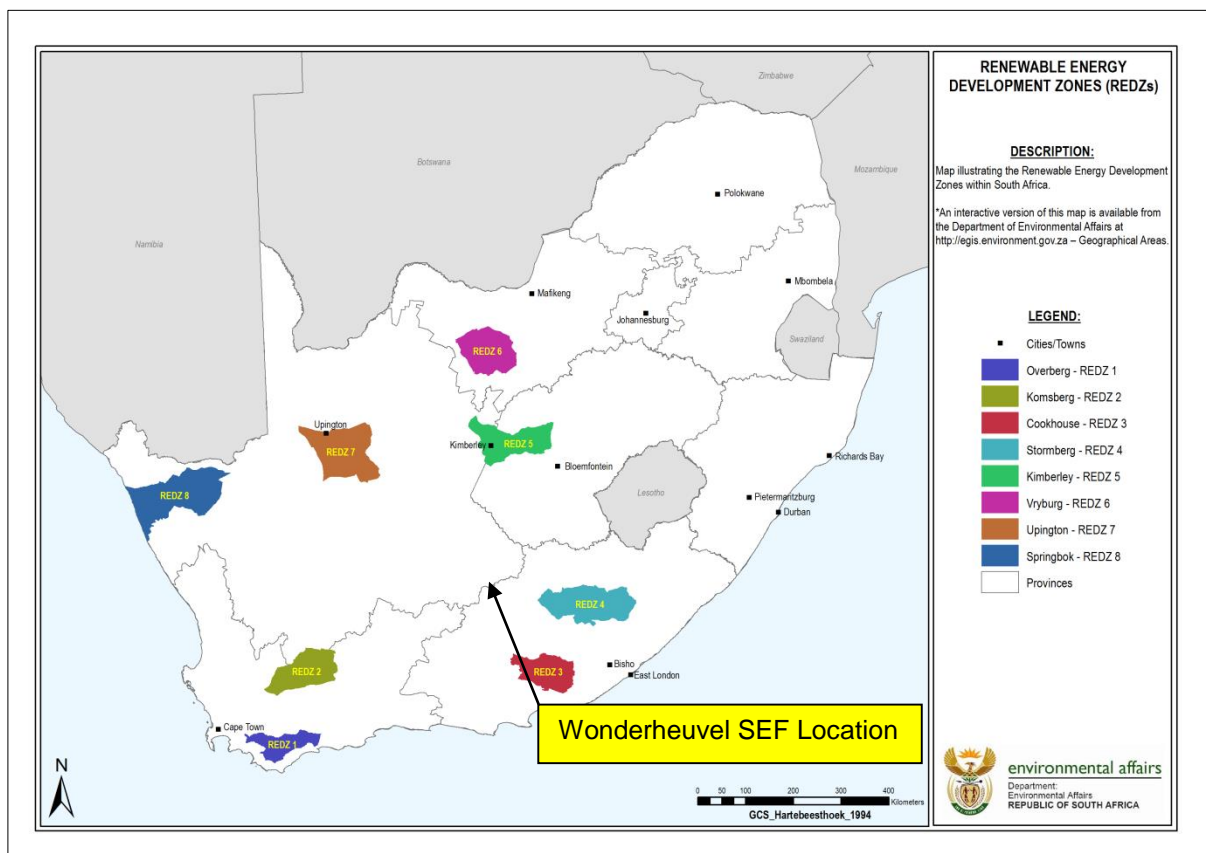
#### 4.1.18 Renewable Energy Development Zones (REDZs)

The Strategic Environmental Assessment (SEA) for Wind and Solar PV Energy in South Africa (CSIR, 2015) has identified eight (8) Renewable Energy Development Zones (REDZs) that are of strategic importance for large-scale wind and solar PV development in terms of *Strategic Integrated Project 8: Green Energy in Support of the South African Economy*, as well as associated strategic transmission corridors, including the rollout of its supporting transmission and distribution infrastructure, in terms of *Strategic Integrated Project 10: Electricity Transmission and Distribution*.

- Renewable Energy Development Zones (REDZs) for large-scale wind and solar photovoltaic development;
- associated Strategic Transmission Corridors which support areas where long-term electricity grid will be developed;
- process of basic assessment to be followed and reduced decision-making timeframe for processing of applications for environmental authorisation in terms of NEMA; and
- acceptance of routes which have been pre-negotiated with all landowners as part of applications for environmental authorisations for power lines and substations.

**Table 9:** The Council for Scientific and Industrial Research (CSIR) identified the following eight (8) geographic areas for REDZ following the SEA

REDZ Number	Name	Applicability of REDZ
REDZ 1	Overberg	Large-scale wind and solar photovoltaic energy facilities
REDZ 2	Komsberg	Large-scale wind and solar photovoltaic energy facilities
REDZ 3	Cookhouse	Large-scale wind and solar photovoltaic energy facilities
REDZ 4	Stormberg	Large-scale wind and solar photovoltaic energy facilities
REDZ 5	Kimberley	Large-scale solar photovoltaic energy facilities
REDZ 6	Vryburg	Large-scale solar photovoltaic energy facilities
REDZ 7	Upington	Large-scale solar photovoltaic energy facilities
REDZ 8	Springbok	Large-scale wind and solar photovoltaic energy facilities



**Figure 8:** Formally gazetted REDZs in South Africa and the proposed Wonderheuvvel SEF location in relation to the REDZs

It should be noted that the proposed facility is not located within any of the above-mentioned REDZs formally gazetted<sup>13</sup> in South Africa for the purpose of development of solar and wind energy generation facilities (**Table 9** and **Figure 8**). Considering this, the proposed Wonderheuvél Solar PV Energy Facility will be subject to a full EIA process in terms of the NEMA, as amended, and the EIA Regulations 2014 (as amended in 2017).

Although the project falls outside of these zones, it will nevertheless contribute towards the requirement of renewable energy highlighted by the development of these zones.

#### 4.1.19 Additional Relevant Legislation

- Occupational Health and Safety Act (OHSA) (Act No. 85 of 1993);
- Road Safety Act (Act No. 93 of 1996);
- National Road Traffic Regulations Act (Act No. 22 of 2000);
- National Environmental Management: Air Quality Act (NEM:AQA) (Act No. 39 of 2004);
- National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008, as amended);
- Development Facilitation (Act No. 67 of 1995);
- The Hazardous Substances Act (Act No. 15 of 1973);
- Water Services Act (Act No. 108 of 1998);
- Electricity Regulation Act (ERA) (Act No. 4 of 2006, as amended);
- Municipal Systems Act (Act No. 32 of 2000);
- Mineral and Petroleum Resource Development Act (Act No. 28 of 2002, as amended); and
- Northern Cape Planning and Development Act (Act No. 7 of 1998).

## 4.2 Key Development Strategies and Guidelines

### 4.2.1 Integrated Development Plan (IDP)

An Integrated Development Plan (IDP) is defined in the Local Government: Municipal Systems Act (Act No. 32 of 2000), as an inclusive and strategic plan that:

- Links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality;
- Aligns the resources and capacity of the municipality with the implementation of the plan
- Forms the policy framework on which annual budgets must be based; and
- Is compatible with national and provincial development plans and planning requirements binding on the municipality in terms of legislation.

Considering the nature and location of the proposed development, there is a clear fit with international, national, provincial and local, at both district and municipal levels, policy and legislation. The IDP for

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<sup>13</sup> Formally gazetted on 16 February 2018 (government notice 114)

the Pixley ka Seme District Municipality is aligned with the National Development Plan, which has identified various central development challenges.

In September 2015 the world's governments signed a historic agreement to eradicate poverty, improve the living standards and well-being of all people, promote peace and more inclusive societies and reverse the trend of environmental degradation. The 2030 Agenda for Sustainable Development commits to promoting development in a balanced way—economically, socially and environmentally—in all countries of the world, leaving no one behind and paying special attention to those people who are poorest or most excluded. It contains 17 Sustainable Development Goals with associated targets to assess progress.

The 17 goals, ranging from alleviating poverty and reducing inequality through job creation and economic growth, as well as ensuring access to affordable, reliable, sustainable and modern energy for all, are in many ways interrelated and cross-cutting in nature. The role of Namakwa DM in the electricity distribution industry, including consideration of renewable energy, reticulation, and municipal debt and tariff structures will be critical.

In his 2015/16 State of the Nation Address, former President Jacob Zuma announced the Nine-Point Plan with a purpose of growing the economy and at the same time fast-tracking the implementation of the NDP.

The first key priority area identified for the Nine-Point Plan is resolving the energy challenge. The Province is moving ahead with the implementation of the nine-point plan, which amongst others include coordinating high impact projects such as the Renewable energy projects and facilitate the forging of partnerships to ensure that these key priorities reach their full potential but more specifically that the people of the Northern Cape people benefit from these.

The proposed Wonderheuvél Solar PV Energy Facility is located within the Umsobomvu Local Municipality and greater Pixley ka Seme District Municipality. On a municipal level, wide support is evident across the affected municipalities. The Pixley ka Seme District Municipality's IDP recognises the potential of renewable energy initiatives and states in its Spatial Development Plan (SDP) that: *'The Pixley Ka Seme District area with its abundance of sunshine and vast tracts of available land has been attracting considerable interest from solar energy investors of late. The high solar index of the area, as indicated by the Solar Index Diagram, provides many opportunities in terms of the development of renewable energy. 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'* (Pixley Ka Seme District Municipality, 2014). The towns of Prieska and Carnarvon have in recent years changed character from small rural towns to potentially regional hubs as a result of investment in renewable energy generation. It should also be noted that as part of one (1) of the IDP's objectives, namely Objective 5: Environmental sustainability and resilience, at least 20 000MW of renewable energy should be contracted by 2030. In addition, it is noted that the municipality has favourable conditions for renewable energy generation, a factor which gives it a possible competitive advantage from an economic perspective. The economy is also characterised by the potential of renewable energy resource generation. In terms of possible opportunities within the municipality, it has been identified that there is a possibility to allow investment in renewable energy resource generation (Pixley ka Seme District Municipality IDP 2017-2022, 2017).

Upon reviewing the spatial planning component, the Pixley ka Seme District Municipality as well as the Umsobomvu Local Municipality spatial development frameworks do not suggest any potential conflicts between the planned spatial development visions and the proposed solar PV energy development. In addition, the site where the proposed development will be constructed is not located near any settlement or significant tourist attraction that might be sensitive to the environmental effects of the proposed development. Although the proposed development is located within relatively close proximity to small patches of agricultural land, it is not expected to affect these areas significantly and the current agricultural activities can thus continue.

After considering the reviewed documentation, the proposed development is in alignment with national, provincial and local objectives, plans and strategies relating to socio-economic development of the areas under analysis. There were no fatal flaws or contraventions identified as all spheres of government prioritise the development of RE projects. The proposed development fits well with the plans to diversify the provincial, district and local economies through investment in RE projects.

It can be suggested that the proposed development does not conflict with any of the identified developmental priorities of the local governments in question but is also in alignment with the identified means to stimulate the local economy. Policy decisions taken in the next decade will largely determine the dimension of the impact of climate change. Local government is in the front line of implementation and service delivery, and thus needs to pursue adequate mitigation and adaptation strategies which should include participation from the public sector, the private sector and NGOs. Therefore, it is evident that the proposed development is aligned with the goals of the municipal IDPs in the study area.

#### *4.2.2 Draft Integrated Energy Plan (IEP) for the Republic of South Africa, 2016*

The Draft Integrated Energy Plan (IEP), developed by the Department of Energy (DoE), is anchored in the National Energy Act (Act No. 34 of 2008). The purpose of the Draft IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development, while:

- Maintaining control over economic costs;
- Serving national imperatives such as job creation and poverty alleviation; and
- Minimising the adverse impacts of the energy sector on the environment.

The Draft IEP takes into consideration the crucial role that energy plays in the entire economy and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple objectives, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector;
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels);

- To guide investment in and the development of energy infrastructure in South Africa; and
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

The Draft IEP considers the national supply and demand balance and proposes alternative capacity expansion plans based on varying sets of assumptions and constraints. While infrastructural matters are briefly discussed, the Draft IEP does not explicitly consider supply and demand at specific geographical locations within the country, nor does it consider infrastructure bottlenecks at specific locations. These are, or will be, covered in detail as follows:

- Electricity infrastructure (transmission and distribution) is dealt with in other plans and the Integrated Resource Plan (IRP) should assess these in detail, taking into consideration the grid planning currently conducted by Eskom;
- Electricity supply is dealt with in the IRP;
- Liquid fuels will be dealt with in the 20-Year Liquid Fuel Infrastructure Roadmap which will cover logistical matters relating to pipelines and storage facilities for petroleum products; and
- The Gas Utilisation Master Plan (GUMP) will take into consideration the bottlenecks and capacity constraints of the current natural gas infrastructure. All the above will inform the integrated energy planning process and will enable overall enhancement through on-going periodic iterations to ensure alignment.

#### 4.2.3 *Integrated Resource Plan, 2010 and updated draft 2018*

The Integrated Resource Plan (IRP) was created in order to plan for projected national electricity demand. The IRP (2010-30) was promulgated in March 2011 and was planned to be a '*living plan*', as it needs to consider changes in the macro-economic environment, developments in new technologies and changes in national priorities and imperatives, amongst other factors. Since the promulgation of the 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 from that expected in 2010. As a result, the DoE is in the processing of updating the IRP and has recently published a Draft IRP for 2018.

While the IRP (2010-30) remains the official government plan for new generation capacity until it is replaced by an updated plan, there are a number of assumptions that have changed, including:

- The changed landscape over the past years, in particular in electricity demand and the underlying relationship with economic growth;
- Electricity demand projection that did not increase as envisaged;
- Technology costs;
- Existing Eskom plant performance that is way below the 80% availability factor; and
- Additional capacity committed to and commissioned, as well as technology costs that have declined significantly.

The Draft IRP 2018 recommends that 10.5% of the generation capacity should be from solar PV energy by 2030, as indicated below in **Figure 9** below.

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
<b>TOTAL INSTALLED</b>	<b>33 847</b>	<b>1 860</b>	<b>4 696</b>	<b>2 912</b>	<b>7 958</b>	<b>11 442</b>	<b>600</b>	<b>11 930</b>	<b>499</b>	<b>2600</b>
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	
<p> <span style="display:inline-block; width:15px; height:15px; background-color:grey; border:1px solid black;"></span> Installed Capacity  <span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span> Committed / Already Contracted Capacity  <span style="display:inline-block; width:15px; height:15px; background-color:lightgreen; border:1px solid black;"></span> New Additional Capacity (IRP Update)  <span style="display:inline-block; width:15px; height:15px; background-color:orange; border:1px solid black;"></span> Embedded Generation Capacity ( Generation for own use allocation) </p>										

**Figure 9:** Proposed updated generation plan for the period ending 2030 (draft IRP, 2018)

#### 4.2.4 Renewable Energy Independent Power Producer Procurement Program (REIPPPP)

The following information was extracted from the Eskom website: Guide to Independent Power Procurement (IPP) processes in South Africa and Eskom, June 2010 ([http://www.eskom.co.za/live/content.php?Item\\_ID=14324](http://www.eskom.co.za/live/content.php?Item_ID=14324)).

The objective of this section is to provide an overview of the processes in the country and within Eskom relating to Independent Power Producers (IPPs). It is important that certain enabling policies, rules and regulations are in place to provide certainty and transparency in the introduction of IPPs.

- Country Process

In August 2009, the DoE gazetted the Electricity Regulations on New Generation Capacity under the ERA. The New Generation Regulations establish rules and guidelines that are applicable to the undertaking of an IPP Bid Programme and the procurement of an IPP for new generation capacity. They also facilitate the fair treatment and non-discrimination between IPPs and the buyer of the energy. In terms of the New Generation Regulations, the IRP developed by the DoE sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-side management projects into account. This required, new generation capacity must be met through the technologies



and projects listed in the IRP and all IPP procurement programmes will be executed in accordance with the specified capacities and technologies listed in the IRP.

A decision that additional capacity be provided by an IPP must be made with the concurrence of the Minister of Finance. Once such a decision is made, a procurement process needs to be embarked upon to procure that capacity in a fair, equitable and transparent process.

The New Generation Regulations set out the procurement process. The stages within a bid programme are prescribed as follows:

- i. Request for Qualifications
- ii. Request for Proposals
- iii. Negotiation with the preferred bidder(s).

A successful bidder will be awarded a Power Purchase Agreement (PPA) subject to signature by the Regulator, namely Eskom.

#### *4.2.5 Department of Energy (DoE) White Paper on Renewable Energy, 2003*

The DoE gazetted its White Paper on Renewable Energy in 2003 and introduced it as a '*policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy.*' At that time, the national target was fixed at 10 000GWh (0.8Mtoe) renewable energy contribution to final energy consumption by 2013. The White Paper proposed that this would be produced mainly from biomass, wind, solar and small-scale hydropower. It went on to recommend that this renewable energy should to be utilised for power generation and non-electric technologies such as solar water heating and biofuels. Since the White Paper was gazetted, South Africa's primary and secondary energy requirements have remained heavily fossil-fuel dependent, both in terms of indigenous coal production and use, as well as the use of imported oil resources. Alongside this, the projected electricity demand of the country has led the National utility Eskom, to embark upon an intensive build programme to secure South Africa's longer-term energy needs, together with an adequate reserve margin.

#### *4.2.6 The Northern Cape Provincial Spatial Development Framework (SDF)*

Energy is one (1) of the primary objectives addressed in the SDF. Their energy objectives include promoting the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising detrimental environmental impacts. The development of the energy sector holds huge benefit for the Northern Cape which would have significant multipliers in the local economy. It is important that innovative planning be undertaken to provide the necessary infrastructure and associated amenities to accommodate the industry in an efficient manner. Therefore, in order to ensure the sustainability of the current and future economic sectors and to maximise synergies, it is imperative that industrial development be undertaken in a manner that promotes the principles of environmental integrity, human wellbeing and economic efficiency.

#### 4.2.7 *Convention on Biodiversity (CBD)*

South Africa became a signatory to the United Nations Convention on Biological Diversity (CBD) in 1993, which was ratified in 1995. The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14(a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

#### 4.2.8 *National Veld and Forest Fire Act (Act No. 101 of 1998)*

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

#### 4.2.9 *Heritage*

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998);
- National Heritage Resources Act (NHRA) (Act No. 25 of 1999); and
- Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002).

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- National Environmental Management Act (NEMA) (Act No. 107 of 1998)
  - Basic Environmental Assessment (BEA) – Section (23)(2)(d);
  - Environmental Scoping Report (ESR) –Section (29)(1)(d);
  - Environmental Impact Assessment (EIA) – Section (32)(2)(d); and
  - Environmental Management Plan (EMP) – Section (34)(b).
- National Heritage Resources Act (NHRA) (Act No. 25 of 1999)
  - Protection of Heritage Resources – Sections 34 to 36; and
  - Heritage Resources Management – Section 38.
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
  - Section 39(3).

The NHRA stipulates that cultural heritage resources may not be disturbed without authorisation from the relevant heritage authority. Section 34(1) of the NHRA states that, '*no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...*' The NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of the NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

## 5 PROJECT NEED AND DESIRABILITY

It is an important requirement in this EIA Process to review the need and desirability of the proposed development. Guidelines on Need and Desirability were published in the Government Gazette of 20 October 2014. These guidelines list specific questions to determine need and desirability of proposed developments. This checklist is a useful tool in addressing specific questions relating to the need and desirability of a proposed development and assists in explaining that need and desirability at the provincial and local context. Need and desirability answer the question of whether the activity is being proposed at the right time and in the right place. **Table 10** includes a list of questions based on the DEFF's Guideline to determine the need and desirability of the proposed development. It should be noted this table was informed by the outcomes of the EIA Process.

Current energy supply in South Africa is primarily coal-based and, although these resources will last for more than a century if used at current rates, large power plants will need to be replaced over the next 30 years. Coal and other fossil fuels, including oil, produce Carbon Dioxide when burned to produce energy. It is now widely accepted that climate change, partially caused by human-generated Carbon Dioxide, is to blame for the higher-than-usual incidence of extremely damaging weather experiences (e.g. storms, droughts, melting polar ice-caps). Local air pollution is strongly related to energy supply options, with coal and oil products being major contributors to urban and rural air pollution and acid rain. One (1) of the primary reasons for promoting renewable energy developments is the desire to make South Africa compliant with international treaties regarding climate-change effects.

Renewable energy options are a sustainable energy supply option that can significantly reduce reliance on fossil fuels. Other advantages include employment creation, proximity to point-of-use, minimal demand for water and less reliance on concentrated sources of energy. Greater use of renewable energy would also reduce South Africa's economic vulnerability to the variable costs of imported fuels. International and local communities are increasingly trying to find ways to shift economies towards greater reliance on renewable energy. Greater uptake of renewable energy would furthermore reduce the global risk of climate change, one (1) of the factors taken into account in designing the conservation network in South Africa.

The combined generation capacity of all the renewable energy developments considered here in this EIA (35km buffer) is just less than 1 600 MW, which is more than the average size of one (1) of the 14 coal power stations in South Africa (Eskom's Generation Division has 14 coal-fired power stations with an installed capacity of 38 548 MW: [www.eskom.co.za](http://www.eskom.co.za)).

**Table 10:** The guideline on the Need and Desirability's list of questions to determine the 'Need and Desirability' of a proposed development.

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
<b>1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area)?</b>	
<p>1.1. How were the following ecological integrity considerations taken into account?:</p> <ul style="list-style-type: none"> <li>1.1.1. Threatened Ecosystems,</li> <li>1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure,</li> <li>1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"),</li> <li>1.1.4. Conservation targets,</li> <li>1.1.5. Ecological drivers of the ecosystem,</li> <li>1.1.6. Environmental Management Framework,</li> <li>1.1.7. Spatial Development Framework, and</li> <li>1.1.8. Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).</li> </ul>	<p><b>The environmental sensitivities present on-site were assessed within the Terrestrial Ecological Assessment undertaken as part of this EIA Process, including CBAs and ESAs. It should be noted that a detailed site walkthrough of the entire project footprint was undertaken during the scoping phase in order to inform the impact assessment. The specialist identified all ecological sensitive areas on-site that would need to be avoided by the proposed development, as well as how to suitably develop within these areas so that the ecological integrity of the areas are maintained (refer to section 6.7 and Appendix 6G).</b></p> <p><b>Following the identification of 'no-go' and sensitive areas, the applicant revised the initial layout.</b></p> <p><b>The mitigation hierarchy of avoidance, reduction and improved management have been applied to inform the findings of the Terrestrial Ecology Impact Assessment. The Ecologist is of the view that the proposed development should be authorised.</b></p> <p><b>An environmental sensitivity map based on the input obtained from the various specialist studies has been included in section 4.3 and section 8 of this FEIAR, as well as Appendix 5. This map was refined prior to the submission of this FEIAR</b></p>
<p>1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be</p>	<p><b>The environmental sensitivities present on-site were assessed within the Terrestrial Ecological Assessment undertaken as part of this EIA Process, including CBAs and ESAs. It should be noted that a detailed site</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
<p>avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p><b>walkthrough of the entire project footprint was undertaken during the scoping phase in order to inform the impact assessment. The specialist identified all ecological sensitive areas on-site that would need to be avoided by the proposed development, as well as how to suitably develop within these areas so that the ecological integrity of the areas are maintained (refer to section 6.7 and Appendix 6G).</b></p> <p><b>The mitigation hierarchy of avoidance, reduction and improved management have been applied to inform the findings of the Terrestrial Ecology Impact Assessment. The Ecologist is of the view that the proposed development should be authorised.</b></p> <p><b>An environmental sensitivity map based on the input obtained from the various specialist studies has been included in section 4.3 and section 8 of this FEIAR, as well as Appendix 5. This map was refined prior to the submission of the DEIAR. Measures to avoid, remedy, mitigate and manage impacts are included within the EMPr (Appendix 8), which forms part of this EIA report.</b></p>
<p>1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p><b>This proposed development has the potential to impact on the terrestrial and aquatic ecology of the area, this includes impacts on the natural vegetation, biodiversity (including avifauna), sensitive habitats (such as watercourses) and ecosystem function. Environmental sensitivities present on-site (including CBAs and ESAs) were assessed by various specialists. This included terrestrial ecology, surface water and avifauna. From a terrestrial ecology perspective, the assessment of impacts indicates that all impacts are of low significance or can be reduced to low significance with mitigation, with the exception of loss of natural</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>vegetation, for which the impact remains of medium significance after mitigation. From a surface water perspective, overall, all impacts were assessed to be low, post-implementation of mitigation measures. From an avifauna perspective, the proposed development will have some pre-mitigation impacts at a site and local level which will range from Medium to Low.</p> <p>The amount of habitat that will be lost to the proposed development is insignificant compared to the area (in hectares) of the regional vegetation type that occurs on-site but may be significant in terms of local patterns and diversity that could be affected.</p> <p>Assessment of the ecological impacts is incorporated in Appendix 6H of this report. In addition, the surface water and avifauna assessments are provided in Appendix 6G and Appendix 6B respectively. Measures to avoid, remedy, mitigate and manage impacts have been included within the terrestrial ecology, avifauna and surface water impact assessments and the Draft EMPr (Appendix 8), which forms part of this EIA report.</p>
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether; what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	<p>It is not anticipated that a significant amount of waste will be generated.</p> <p>The EMPr (Appendix 8) includes measures to avoid, remedy, mitigate and manage impacts with regards to waste and waste management.</p>
1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	<p>A Desktop Heritage Impact Assessment (HIA), including a full Palaeontology Impact Assessment (PIA), was undertaken as part of the EIA process for this proposed development. <u>The overall findings of the HIA indicate that pre-mitigation a negative high impact is projected but with the implementation of the recommended</u></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p><b><u>management measures this impact rating will be reduced to low negative.</u></b></p> <p>The HIA consisted of a scoping phase during which background information and landscape analysis was done to determine the heritage resources that can potentially occur within the study area. This was followed up with fieldwork by a team of archaeologist and a palaeontologist with the aim of identifying heritage resources in the development footprint areas and to make recommendations on the management of these resources and the possible chance finds during construction activities. The fieldwork was undertaken in August 2019 and the results have been incorporated into this FEIAR, as well as the updated HIA Report (Appendix 6D).</p> <p>It is anticipated that the proposed development will have an acceptable low impact on heritage resources. However, it must be noted that there are two (2) operational projects which are located within a 35km radius of the proposed site, namely the Linde SEF and Noupoot Wind Farm, in addition to several other renewable energy developments which are being proposed or have already received approval. Thus, changes to the current cultural landscape are already in process. The HIA Report is included in Appendix 6D of this FEIAR. The PIA Report is included in Appendix 6E of this FEIAR.</p>
<p>1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be</p>	<p><b>This proposed development requires water during the construction phase. Minimal water is required during the operational phase. At this stage, it is anticipated that water will be sourced from the local municipality. Should the local municipality not be able to ensure water supply, other local water sources (e.g. Boreholes) will be</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
<p>avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</p>	<p><b>investigated. The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately.</b></p>
<p>1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?</p> <p>1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. dematerialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)</p> <p>1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources of the proposed development alternative?)</p>	<p><b>The proposed development aims to harness solar energy for the generation of electricity. This proposed development is seen as a source of clean energy and reduces the dependence on non-renewable sources, such as coal-fired power plants. The proposed development is however <u>not</u> located in any of the REDZs, where wind and solar PV development is being incentivised from resource, socio-economic and environmental perspectives. For more information, <u>please refer to the Alternatives section included in section 3.3 of this FEIAR for an outline of the suitability of this activity.</u></b></p>



<b>NEED</b>	
<b>Question</b>	<b>Response</b>
1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	
<p>1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts?:</p> <p>1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</p> <p>1.8.2. What is the level of risk associated with the limits of current knowledge?</p> <p>1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</p>	<p><b>The precautionary approach has been adopted for this EIA process (i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts).</b></p> <p><b>The assessment of cumulative impacts assumed that all proposed renewable energy developments within a 35km radius will be constructed. In reality, only a handful of proposed renewable energy developments would be constructed and therefore this approach is considered to be precautionary in nature.</b></p> <p><b>Additionally, based on the specialist findings, the layout was amended to avoid sensitive areas, where possible. This has been assessed and discussed in more detail in section 8 of this report.</b></p> <p><b>Please refer to Appendix 6 of this report for the full specialist studies which were undertaken as part of this EIA process. These studies outline the assumptions and limitations that were applicable to the respective studies. The assumptions and limitations have also been detailed in section 2 of this report.</b></p> <p><b>The risk associated with the limits in knowledge is considered to be low.</b></p>
<p>1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following?:</p> <p>1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts,</p>	<p><b>Please refer to section 6 and section 7 of this FEIAR for the results of the specialist assessments which were undertaken as part of this EIA process. In addition, all specialist assessments are provided in Appendix 6 of this FEIAR.</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
<p>visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</p> <p>1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</p>	<p><b>The overall negative impact to people's environmental right in terms of social and visual impacts are considered to be low to moderate and moderate respectively. In addition, the Social Impact Assessment found that the proposed development has a positive element which outweighs the negative in that it will contribute towards the supply of renewable energy into a grid system heavily reliant on coal-powered energy generation.</b></p>
<p>1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?</p>	<p><b>This is considered and addressed as part of the Social Impact Assessment which was undertaken as part of the EIA process for this proposed development (included in Appendix 6F and summarised in section 6.14 and section 7 of this FEIAR).</b></p> <p><i>The study concluded that 'regarding the social impacts associated with the project it was found that most apply over the short term to the construction phase of the project. Of these impacts all can be mitigated to within acceptable ranges and there are no fatal flaws associated with the construction or operation of the project.</i></p> <p><i>On a cumulative basis it is evident that the cumulative impacts associated with changes to the social environment of the region are more significant than those attached to the project in isolation. On a negative front there are two (2) issues associated with developments in the region that are of most concern. The first of these issues is the change to the sense of place of an area that was once considered a pristine region of South Africa. The second is the potential, through an influx of labour and an increase in transportation to constructions sites, of the risk for the prevalence of HIV to rise in an area that has a relatively low HIV prevalence rate. In this regard it is important that the</i></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p><i>relevant authorities recognise these issues and find ways of mitigating them to ensure that they do not undermine the benefit that renewable energy projects bring, both to the region as well as to the country as a whole. These issues are beyond a project-specific basis and as such will need to be addressed at a higher level.'</i></p> <p><i>Additionally, 'the project site and surrounding areas are sparsely populated with the agricultural potential of the area being low. Accordingly, the negative social impacts associated with the proposed Wonderheuvel solar PV facility are of low to moderate significance with most occurring over the short term construction phase. The project has a positive element which outweighs the negative in that it will contribute towards the supply of renewable energy into a grid system heavily reliant on coal-powered energy generation. In this sense the project forms part of a national effort to reduce South Africa's carbon emissions and thus carries with it a significant social benefit and is thus supported and should proceed.'</i></p> <p><i>With regards to the EIA phase, the following was noted: 'As the area is sparsely populated and the negative social impacts associated the solar PV facility and associated grid infrastructure of moderate significance it is most unlikely that any further social study will be necessary. This will, however, be dependent on the outcome of the public participation process which may result in a need to update the current report by incorporating the comments recorded and updating the social impacts accordingly.'</i></p>
1.11. Based on all of the above, how will this development positively or negatively impact on	<b>The proposed Wonderheuvel Solar PV Energy Facility will have a positive impact on the ecological integrity objectives or targets</b>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
ecological integrity objectives / targets / considerations of the area?	<p>of the area. This has been discussed in detail in the <b>Social Impact Assessment</b>, which is summarised in section 6.14 and section 7 of this FEIAr. The full impact assessment is included in Appendix 6F of this FEIAr.</p> <p>The proposed Wonderheuvél Solar PV Energy Facility will therefore be aligned with the vision and goals of the DM and the LM.</p>
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	<b>Please refer to the Alternatives section (section 3.3 of this FEIAr) for an outline of the suitability of this activity.</b>
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	<b>Please refer to the summary of the findings from the Terrestrial Ecology Impact Assessment in section 6.7 and section 7 of this FEIAr. The full Terrestrial Ecology Impact Assessment is provided in Appendix 6H of this FEIAr</b>
<b>2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?</b>	
2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area.	<b>The Pixley ka Seme District Municipality's IDP recognises the potential of renewable energy initiatives and states in its SDP that: <i>'The Pixley Ka Seme District area with its abundance of sunshine and vast tracts of available land has been attracting considerable interest from solar energy investors of late. The high solar index of the area, as indicated by the Solar Index Diagram, provides many opportunities in terms of the development of renewable energy. 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.'</i></b>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>The proposed Wonderheuvél Solar PV Energy Facility will therefore be aligned with the vision and goals of the DM.</p> <p>The proposed development will also be supportive of the IDPs' objective of creating more job opportunities. The proposed development will lead to the creation of both direct and indirect job which will have a positive economic benefit within the region (if the DEFF grants an EA). There are approximately 297 jobs associated with the construction phase. It is likely that approximately 75% of this workforce will be recruited from within local communities, creating employment opportunities for residents of Middelburg, Noupoot and Hanover. Many of the beneficiaries are likely to be historically disadvantaged members of the community and the project will provide opportunities to develop skills amongst these people. The operational phase will employ approximately 16 people full time for a period of up to 20 years.</p> <p>It should however be noted that employment during the construction phase will be temporary, whilst being long-term during the operational phase. Therefore, the proposed development would help to address the need for increased electricity supply (on a national level) while also be providing advanced skills transfer and training to the local communities and creating contractual and permanent employment in the area.</p> <p>Apart from construction and operational phase jobs, the proposed development is also likely to stimulate the local economy as there will be a significant economic contribution attached to the proposed development. This contribution will be in the</p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>form of disposable salaries and the purchases of services and supplies from the local communities in and around the towns of Noupoot, Hannover and Middleburg. Apart from job creation and procurement spend, the proposed development will also have broader positive socio-economic impacts as far as socio-economic development contributions are concerned. This will create an opportunity to support the local community over the life span of the operational phase of the proposed development which will stretch over a 20-year period.</p>
<p>2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integration of segregated communities, need to upgrade informal settlements, need for densification, etc.),</p>	<p><b>Not applicable. The proposed development is located within a rural area and the site is zoned for agricultural use.</b></p>
<p>2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.)</p>	<p><b>Please refer to section 6 and section 7 of this FEIAR for a description of the receiving environment and results of the impact assessment, respectively.</b></p> <p><b>The impact of the proposed development on cultural / heritage areas (archaeology and palaeontology) have been assessed in the form of a HIA and full PIA. The HIA Report is provided in Appendix 6D of this FEIAR, and the results are summarised in section 6.13 and section 7 respectively. The PIA Report is provided in Appendix 6E of this FEIAR, and the results are summarised in section 6.13 and section 7 respectively.</b></p> <p><b>As mentioned, the HIA consisted of a scoping phase during which background information and landscape analysis was done to determine the heritage resources that can potentially occur within the study area. This was followed up with fieldwork by a team of archaeologist and a palaeontologist with the aim of identifying</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>heritage resources in the development footprint areas and to make recommendations on the management of these resources and the possible chance finds during construction activities. The fieldwork was undertaken in August 2019 and the results have been incorporated into this FEIAr, as well as the updated HIA Report.</p> <p>The proposed site is currently being used for agricultural purposes, predominantly sheep farming. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. The low climatic moisture availability means that natural grazing is the only viable agricultural land-use for most of the area, except for the small patches of irrigation. The majority of the study area has low agricultural potential and therefore low agricultural sensitivity to development and consequent loss of agricultural land use. The only exception are the small patches of irrigation. These should be considered no-go areas for any footprint of development that will exclude cultivation.</p> <p>Should the proposed development proceed, less than 1000ha of the application site will be developed on. However, it is not expected that this will significantly threaten the agricultural activities present in the study area. An Agricultural and Soils Impact Assessment (Appendix 6A of this FEIAr and results summarised in section 6.10 and section 7 respectively) was undertaken as part of the EIA process and is included within this FEIAr to reflect the impact of the proposed development in terms of the land-use and agricultural potential. Agricultural impacts of the proposed development are</p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<b>assessed as being of low to medium significance.</b>
2.1.4. Municipal Economic Development Strategy ("LED Strategy").	<b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAr respectively, and included in Appendix 6F of this FEIAr, for an outline of how the LED Strategy has been considered.</b>
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	<b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAr respectively, and included in Appendix 6F of this FEIAr, for an outline of the social impacts that could occur due to the proposed development of the solar PV energy facility.</b>
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long term? Will the impact be socially and economically sustainable in the short- and long-term?	
<b>2.5. In terms of location, describe how the placement of the proposed development will:</b>	
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	<b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAr respectively, and included in Appendix 6F of this FEIAr, for an outline of the positive impacts associated with the creation of employment opportunities that could be created by the proposed solar PV energy facility.</b>
2.5.2. reduce the need for transport of people and goods,	<b>Not applicable. This is a proposal for a renewable energy development.</b>
2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	<b>Not applicable. This is a proposal for a renewable energy development.</b>



<b>NEED</b>	
<b>Question</b>	<b>Response</b>
2.5.4. compliment other uses in the area,	<p><b>An Agricultural and Soils Impact Assessment was undertaken as part of the EIA process in order to determine the impact on the current land-use. Refer to section 6.10, section 7 and Appendix 6F for a summary of the study and the full study, respectively.</b></p> <p><b>The proposed site is currently being used for agricultural purposes, predominantly sheep farming. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. The low climatic moisture availability means that natural grazing is the only viable agricultural land-use for most of the area, except for the small patches of irrigation. The majority of the study area has low agricultural potential and therefore low agricultural sensitivity to development and consequent loss of agricultural land use. The only exception are the small patches of irrigation. These should be considered no-go areas for any footprint of development that will exclude cultivation.</b></p> <p><b>Should the proposed development proceed, less than 1000ha of the application site will be developed on. However, it is not expected that this will significantly threaten the agricultural activities present in the study area as it will be undertaken in tandem.</b></p>
2.5.5. be in line with the planning for the area,	
2.5.6. for urban-related development, make use of underutilised land available with the urban edge,	<b>Not applicable. The proposed development is located within a rural area and the proposed site is zoned for agricultural use.</b>
2.5.7. optimise the use of existing resources and infrastructure,	<b>The proposed development will connect to the Hydra D MTS<sup>11</sup>, which will still be constructed, based on the preference for the overhead power line corridor route proposed as part of the electrical infrastructure BA (part of a separate on-going BA process with DEFF Ref No.: <u>14/12/16/3/3/1/2134</u>). In</b>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	addition, the proposed development will make use of existing site roads as far as possible. It will also make use of the excellent on-site solar resource.
2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	<b>Not applicable. The proposed development is a renewable energy project and is not related to bulk infrastructure expansion.</b>
2.5.9. discourage "urban sprawl" and contribute to compaction/densification,	<b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAR respectively, and included in Appendix 6F of this FEIAR, for management measures on how to manage the impact associated with the '<i>disruption of local social structures as a result of the construction workforce and in-migration of job seekers</i>'.</b>
2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	<b>Not applicable. The proposed development is located within a rural area and the site is zoned for agricultural use.</b>
2.5.11. encourage environmentally sustainable land development practices and processes,	<b>Based on the findings of the assessments, the proposed development would <u>not</u> have a significant ("high") negative impact on the receiving environment, with the implementation of suitable mitigation measures (refer to section 7) and will therefore not go against sustainable land development practices and processes. In addition, the proposed development will be designed according to relevant national specifications and standards which are regarded as best practice in the renewable energy sector. In addition, the proposed development will be aligned with national planning priorities, despite not being located within any of the eight (8) identified REDZs.</b>
2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic	<b>Please refer to the Alternatives section included in section 3.3 of this FEIAR for an</b>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
mineral resource, access to the port, access to rail, etc.),	<b>outline of the selection and suitability of this activity.</b>
2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	<p><b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAR respectively, and included in Appendix 6F of this FEIAR. It should be noted that the applicant will ultimately own the proposed development and, if successful, will compile an Economic Development Plan which will be compliant with REIPPPP requirements and will inter alia set out to achieve the following:</b></p> <ul style="list-style-type: none"> <li>• <b>Create a local community trust or similar (as required by REIPPPP) which has an equity share in the project life to benefit historically disadvantaged communities;</b></li> <li>• <b>Initiate a skills development and training strategy to facilitate future employment from the local community;</b></li> <li>• <b>Give preference to local suppliers for the construction of the facility; and</b></li> <li>• <b>Support local community upliftment projects and entrepreneurship through socio-economic and enterprise development initiatives.</b></li> </ul>
2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	<p><b>A Desktop HIA, including a full PIA, was undertaken as part of the EIA process for this proposed development. <u>The overall findings of the HIA indicate that pre-mitigation a negative high impact is projected but with the implementation of the recommended management measures this impact rating will be reduced to low negative.</u></b></p> <p><b>As mentioned, the HIA consisted of a scoping phase during which background information and landscape analysis was done to determine the heritage resources that can potentially occur within the study area. This was followed up with fieldwork by a team of archaeologist and a</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>palaeontologist with the aim of identifying heritage resources in the development footprint areas and to make recommendations on the management of these resources and the possible chance finds during construction activities. The fieldwork was undertaken in August 2019 and the results have been incorporated into this FEIAr, as well as the updated HIA Report (Appendix 6D).</p>
<p>2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?</p>	<p>The proposed solar PV energy facility is not located within any of the eight (8) REDZs. There are however two (2) operational projects which are located within a 35km radius of the proposed site (namely the Linde SEF and Noupoot Wind Farm), in addition to several other renewable energy developments which are being proposed or have already received approval, which lends itself potentially to a renewable energy development area. Refer to Table 28 for an outline of the other renewable energy developments which are operational, are being proposed or have already received approval within a 35km radius.</p>
<p><b>2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?</b></p>	
<p>2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</p>	<p><b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAr respectively, and included in Appendix 6F of this FEIAr.</b></p>
<p>2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?</p>	
<p>2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</p>	
<p><b>2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:</b></p>	

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	<p><b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAr respectively, and included in Appendix 6F of this FEIAr.</b></p>
2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	
2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has	

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
been addressed throughout the development's life cycle?	
<b>2.13. What measures were taken to:</b>	
2.13.1. ensure the participation of all interested and affected parties,	<p><b>The activities which have been undertaken as part of the Public Participation Process (PPP) for the proposed development are outlined in this FEIAR (Appendix 7 and summarised in section 9 of this report). Various methods were employed to notify potential I&amp;APs of the proposed development, namely through an advert in a local newspaper, site notices on the affected property and notification letters. In addition, posters were erected in Noupoot and Background Information Documents (BIDs) were also distributed here (Appendix 7A).</b></p> <p><b>The DSR was released for a 30-day review and commenting period to all the relevant Interested and/or Affected Parties (I&amp;APs), Organs of State (OoS) / authorities and key stakeholders from Friday 26 July 2019 to Monday 26 August 2019. Hard copies of the DSR were made available at a public venue (namely the Noupoot Public Library) and an electronic copy was also made available on SiVEST's website. All I&amp;APs and key stakeholders / OoS / authorities, who are registered on the project database, were notified of the submission of the DSR and the above-mentioned 30-day public review and comment period accordingly. In addition, all key stakeholders / OoS / authorities were sent electronic copies (on CD) of the DSR. The DSR was thereafter updated and the FSR was submitted to the DEFF on Friday 06 September 2019. All &amp;APs and key stakeholders / OoS / authorities, who are registered on the project database, were notified of the submission of the FSR. After evaluating the FSR the DEFF issued a letter, dated 08 October 2019, indicating that the documents complied with the minimum</b></p>
2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	
2.13.3. ensure participation by vulnerable and disadvantaged persons,	
2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	
2.13.5. ensure openness and transparency, and access to information in terms of the process,	
2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein was promoted.	

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>requirements of the EIA Regulations, 2014 (as amended), and that SiVEST could proceed with the EIA process (i.e. DEIAr and FEIAr). The DEIAr was made available to the public for a period of 30 days from 22 November 2019 until 13 January 2020 (excluding public holidays and the DEFF's closure period). Hard copies of the DEIAr was also made available at a public venue (namely the Noupoot Public Library) and an electronic copy was also made available on SiVEST's website (see section 9.7). In addition, all OoS / authorities were sent electronic copies (on CD) of the DEIAr. It should be noted that two (2) meetings were undertaken during the DEIAr review and comment period, namely one (1) Public Meeting and one (1) Focus Group Meeting (FGM). Invitations to these meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&amp;APs and key stakeholders (including affected and adjacent landowners) on the project database. Additionally, Ward Councilors were utilised in order to distribute / share information with members of the affected communities. Members of the affected communities were encouraged to contact SiVEST in order to register as an I&amp;AP on the project database and to obtain project information and/or notifications (section 9.9). All comments received to date have been responded to in the C&amp;RR (Appendix 7E). Comments received on the DEIAr were taken into consideration, incorporated into the report (where possible) and will be used when compiling this FEIAr. The FEIAr was submitted to the DEFF for decision-making on Thursday the 13<sup>th</sup> of February 2020. All comments received to date have been responded to in a C&amp;RR (included as Appendix 7E).</p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>Please refer to section 9 of this FEIAR for details regarding the PPP which has been undertaken as part of the EIA process to date.</p> <p>The Scoping and EIA process has taken cognisance of all interests, needs and values espoused by all I&amp;APs, including occupiers. Opportunity for public participation has been provided to all I&amp;APs throughout the Scoping Phase and will be provided during the EIA phase in terms of the 2014 EIA Regulations, as amended.</p>
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Please refer to the <b>Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAR respectively, and included in Appendix 6F of this FEIAR.</b>
2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	<b>An EMPr has been developed to address health and safety concerns and is included in the EIA report. An Environmental Control Officer (ECO) will also be appointed to monitor compliance from an environmental perspective.</b>
<b>2.16. Describe how the development will impact on job creation in terms of, amongst other aspects:</b>	
2.16.1. the number of temporary versus permanent jobs that will be created,	<p><b>Please refer to the Social Impact Assessment summarised in section 6.14 and section 7 of this FEIAR respectively, and included in Appendix 6F of this FEIAR.</b></p>
2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.16.3. the distance from where labourers will have to travel,	
2.16.4. the location of jobs opportunities versus the location of impacts (i.e.	



<b>NEED</b>	
<b>Question</b>	<b>Response</b>
equitable distribution of costs and benefits),	
2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
<b>2.17. What measures were taken to ensure:</b>	
2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment,	<b>Legislation, policies and guidelines, which could apply to impacts of the proposed development on the environment, have been considered. The scope and content of this FEIAR have been informed by applicable integrated environmental management legislation and policies. This has been outlined in section 4 of this FEIAR.</b>
2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	<p><b>The activities which have been undertaken as part of the PPP for the proposed development are summarised in section 9 on page 320 of this FEIAR. Various methods were employed to notify potential I&amp;APs of the proposed development, namely through an advert in a local newspaper, site notices on the affected property and notification letters. In addition, posters were erected in Noupoot and BIDs were also distributed here (Appendix 7A).</b></p> <p><b>The DSR was released for a 30-day review and commenting period to all the relevant I&amp;APs, OoS / authorities and key stakeholders from Friday 26 July 2019 to Monday 26 August 2019. Hard copies of the DSR were made available at a public venue (namely the Noupoot Public Library) and an electronic copy was also made available on SiVEST's website. All I&amp;APs, OoS / authorities and key stakeholders, which are registered on the project database, were notified of the submission of the DSR and the above-mentioned 30-day public review and comment period accordingly. In addition, all OoS / authorities were sent electronic copies (on CD) of the DSR. The DSR was thereafter</b></p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>updated and the FSR was submitted to the DEFF on Friday 06 September 2019. All I&amp;APs, OoS / authorities and key stakeholders, which are registered on the project database, were notified of the submission of the FSR. After evaluating the FSR the DEFF issued a letter, dated 08 October 2019, indicating that the documents complied with the minimum requirements of the EIA Regulations, 2014 (as amended), and that SiVEST could proceed with the EIA process (i.e. DEIAr and FEIAr). The DEIAr was made available to the public for a period of 30 days from 22 November 2019 until 13 January 2020 (excluding public holidays and the DEFF's closure period). Hard copies of the DEIAr were also made available at a public venue (namely the Noupoot Public Library) and an electronic copy will also be made available on SiVEST's website (see section 9.7). In addition, all OoS / authorities were sent electronic copies (on CD) of the DEIAr. It should be noted that two (2) meetings were undertaken during the DEIAr review and comment period, namely one (1) Public Meeting and one (1) Focus Group Meeting (FGM). Invitations to these meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&amp;APs and key stakeholders (including affected and adjacent landowners) on the project database. Additionally, Ward Councilors were utilised in order to distribute / share information with members of the affected communities. Members of the affected communities were encouraged to contact SiVEST in order to register as an I&amp;AP on the project database and to obtain project information and/or notifications (section 9.9). All comments received to date have been responded to in the C&amp;RR (Appendix 7E). Comments received on the DEIAr were taken</p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	<p>into consideration, incorporated into the report (where possible) and will be used when compiling this FEIAR. The FEIAR was submitted to the DEFF for decision-making on Thursday the 13<sup>th</sup> of February 2020. All comments received to date have been responded to in a C&amp;RR (included as Appendix 7E).</p> <p>Please refer to section 9 of this FEIAR for details regarding the PPP which has been undertaken as part of the EIA process to date.</p> <p>The scoping and EIA process has taken cognisance of all interests, needs and values espoused by all I&amp;APs, including occupiers. Opportunity for public participation has been provided to all I&amp;APs throughout the Scoping Phase and will be provided during the EIA phase in terms of the 2014 EIA Regulations, as amended.</p>
2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	<b>The outcomes of this EIA process and the associated conditions of the EA (should it be granted) will serve to address this question.</b>
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	<p><b>The mitigation measures proposed by the respective specialists have been included in the EMPr (Appendix 8), where applicable.</b></p> <p>The proposed mitigation measures have been informed by the respective specialist studies undertaken. This includes a detailed assessment of the environment as well as the impacts associated with the proposed development. Solar PV energy facilities can be dismantled and completely removed from the site leased for the proposed development and do not permanently prevent alternative land-uses on the same land parcel. Based on material and socio-economic terms and</p>

<b>NEED</b>	
<b>Question</b>	<b>Response</b>
	measured to the value of the best alternative that is not chosen, the proposed development will result in positive opportunity costs.
2.20. What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	<b>The EMPr which is included in the EIA report (Appendix 8) must form part of the contractual agreement and be adhered to by both the contractors / workers and the applicant.</b>
2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	<b>Please refer to the Alternatives section included in section 3.3 of this FEIAr for an outline of the selection and suitability of this activity.</b>
2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	<b>Please refer to section 7.3 of this FEIAr for a summary of the cumulative impacts.</b>

## **5.1 National Renewable Energy Requirement**

In 2010, South Africa had 44 157MW of power generation capacity installed. Current forecasts indicate that by 2025, the expected growth in demand will require the current installed power generation capacity to be almost doubled to approximately 74 000MW (SAWEA, 2010).

This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. Despite the worldwide concern regarding Green House Gas (GHG) emissions and climate change, South Africa continues to rely heavily on coal as its primary source of energy, while most of the countries renewable energy resources remain largely untapped (DME, 2003). There is therefore an increasing need to establish a new source of generating power in South Africa within the next decade.

The use of renewable energy technologies, as one (1) of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process. It must be remembered that solar energy is plentiful, renewable, widely distributed, clean and reduces GHG emissions when it displaces fossil-fuel derived from electricity. In this light, renewable solar energy can be seen as desirable.

The REIPPPP and the competitiveness nature of the bidding process has resulted in significant lowering of solar and wind tariff prices since 2011. Solar PV, for example, was bid with tariffs of R2.80/kWh at the inception of the REIPPPP in 2011, to 60c/kWh at present. Further projects will increase the competitive nature of the REIPPPP and further result in cost savings to South African consumers.

## 5.2 National Renewable Energy Commitment

In support of the need to find solutions for the current electricity shortages, the increasing demand for energy, as well as the need to find more sustainable and environmentally friendly energy resources, South Africa has embarked on an infrastructure growth programme supported by various government initiatives. These include the National Development Plan (NDP), the Presidential Infrastructure Coordinating Commission (PICC), the DoE's Integrated Resource Plan, the National Strategy for Sustainable Development, the National Climate Change Response White Paper, the Presidency of the Republic of South Africa's Medium-Term Framework, and the National Treasury's Carbon Tax Policy Paper.

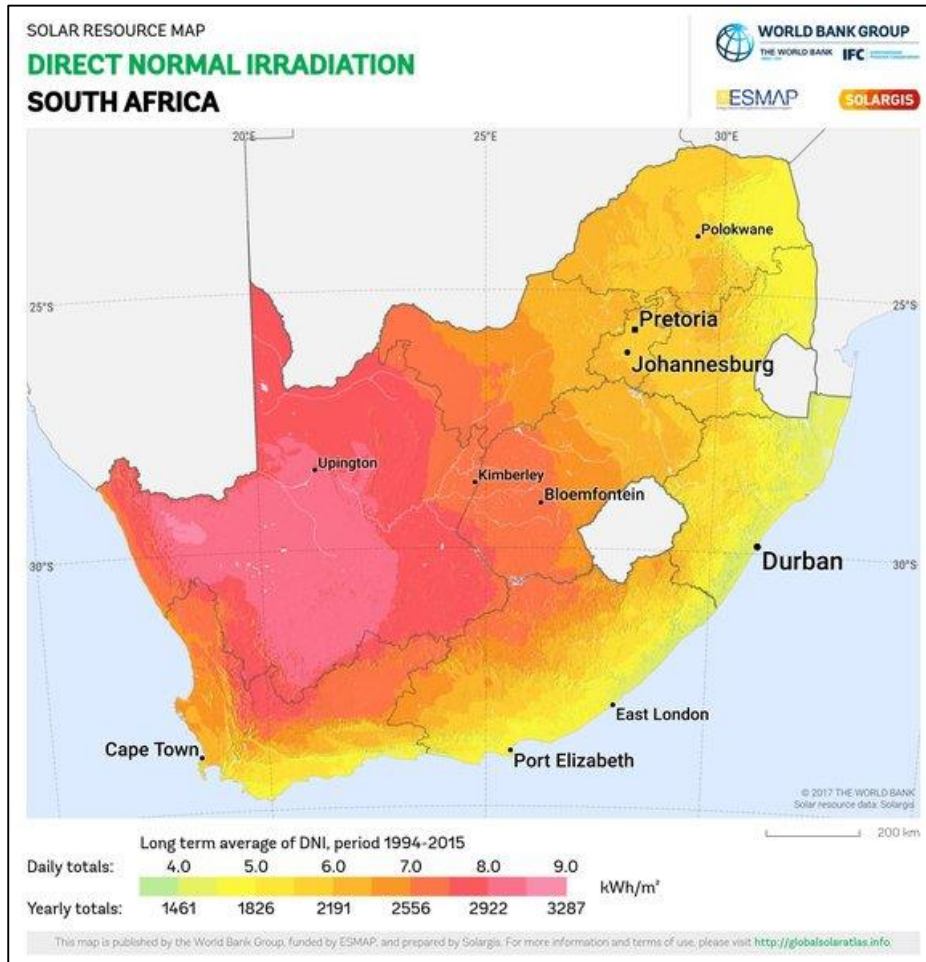
The Government's commitment to growing the renewable energy industry in South Africa is also supported by the *White Paper on Renewable Energy* (2003) which sets out the Government's principals, goals and objectives for promoting and implementing renewable energy in South Africa. In order to achieve the long-term goal of achieving a sustainable renewable energy industry, the DoE has set a target of contributing 17,8GW of renewable energy to the final energy consumption by 2030. This target is to be produced mainly through, wind and solar; but also, through biomass and small-scale hydro (DME, 2003; IRP, 2010). According to the 2018 Draft IRP, 1474MW of solar energy output capacity had been installed by 2018 already, while 1980MW of wind energy output capacity had been installed (**Figure 9**). Additionally, the 2018 Draft IRP states that new installed energy capacity to 2030 will include 2500MW hydro, 5600MW wind and 8100MW solar PV. It is also recommended that 10.5% of the generation capacity should be from solar PV energy by 2030 (Draft IRP, 2018).

## 5.3 Site-Specific Suitability

The selection of a potential site for the proposed solar PV energy facility included several key aspects, namely solar resource, climate, topography, environmental, grid connections and access to the site. As mentioned, the proposed project site has been identified through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects.

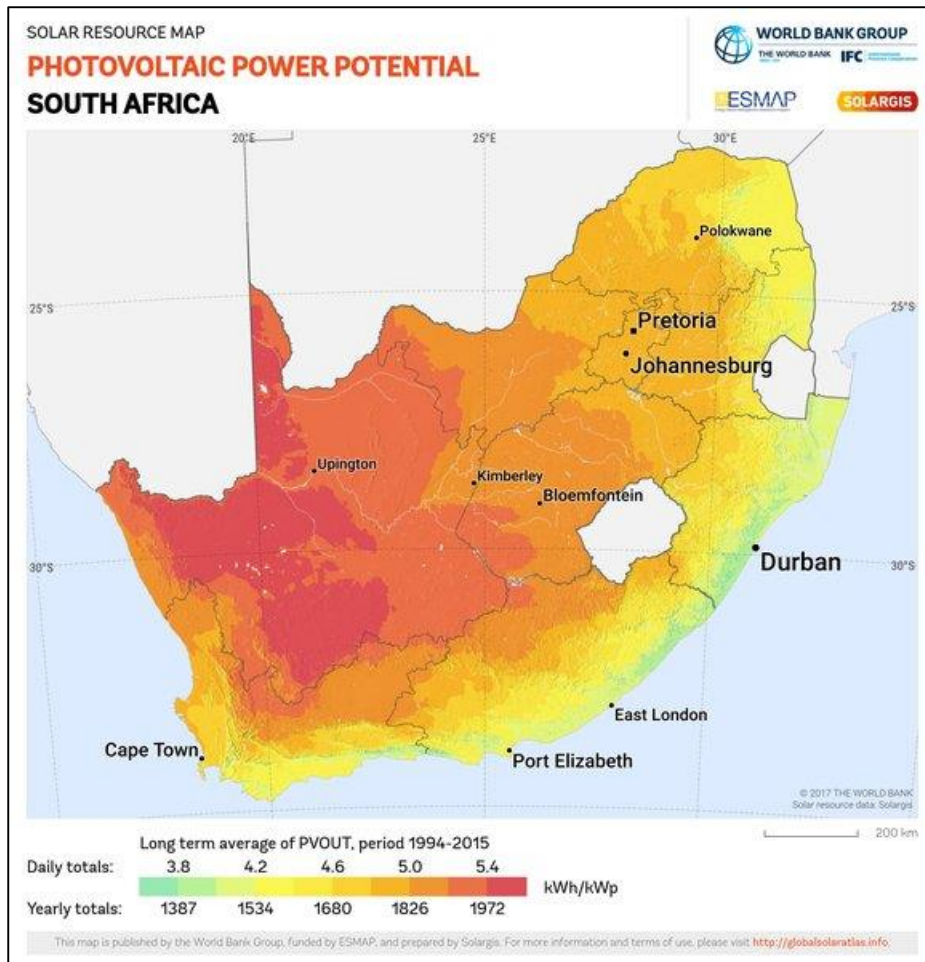
According to the Direct Normal Solar Irradiation (DNI) map below (**Figure 10**), the Northern Cape Province of South Africa has the highest DNI predicted, ranging from approximately 2556 to 3287

kWh/m<sup>2</sup>/year. In addition, as mentioned, the project site receives an annual GHI ranging from approximately 1972 to 2264kWh/m<sup>2</sup>/year (**Figure 6**).



**Figure 10:** Direct Normal Solar Irradiation (DNI) map (Source - 2017 The World Bank, Solar resource data: SolarGis)

Based on the Photovoltaic (PV) Power Potential map below (**Figure 11**), the Northern Cape is the province in South Africa with the highest solar potential. The project site is thus suitable for the establishment of the proposed solar PV energy facility. Based on an estimation of the solar energy resource as well as weather, dust, dirt, surface albedo and the pre-feasibility studies conducted by Wonderheuvl Solar Power, the site has been identified as optimal for the proposed Wonderheuvl Solar PV Energy Facility.



**Figure 11:** Photovoltaic (PV) Power Potential map (Source - © 2017 The World Bank, Solar resource data: SolarGis)

The proposed project site is not located in any of the eight (8) identified REDZs, which are geographical areas that have been identified on a strategic planning level to have reduced negative environmental impacts but high commercial attractiveness (due to its proximity to, *inter alia*, the national grid) and socio-economic benefit to the country. Despite this, the development of the proposed solar PV energy facility is still considered to be important for South Africa as it will reduce the country’s overall environmental footprint from power generation (including externality costs), and thereby steer the country on a pathway towards sustainability. The proposed development will provide socio-economic benefits to the region it is situated in and will have a high commercial attractiveness. In addition, the negative environmental impacts associated with the proposed development can be mitigated to acceptable levels.

Solar resource is only one (1) driver of site selection. The other aspects should be considered when holistically evaluating a proposed development.

The proposed site is currently being used for agricultural purposes, predominantly sheep farming. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. The low climatic moisture availability means that natural grazing is the only viable agricultural land-use for most of the area, except for the small patches of irrigation. In addition, isolated farmsteads, including farmworker’s dwellings,

and ancillary farm buildings can also be found within the study area. It is expected that the small patches of irrigation will be unaffected by the proposed development as these should be considered 'no-go' areas for any footprint of development that will exclude cultivation. As such, it is not envisioned that farming activities will be impacted after the construction phase has been completed. It is not anticipated that any of the farmsteads, farmworkers' dwellings or ancillary farm buildings located within the application site will need to be moved or decommissioned. The applicant is however willing to relocate any farmworkers' dwellings or any other farm buildings, if needed. Should infrastructure changes be required, this will be discussed with the relevant landowner(s). It must be noted that the affected landowners are in support of the proposed development as they understand the importance of building generation capacity. The proposed project site is therefore considered to be suitable from a land-use perspective.

Grid connection suitability is the next element which drives the project location. Long connection lines have increased environmental impacts as well as add increased costs to the proposed development. The Wonderheuveld project site has good grid connection potential as the proposed solar PV energy facility will connect to the Hydra D MTS or the proposed Coleskop WEF substation (depending on which grid connection infrastructure option is chosen as 'preferred'), which are still to be constructed. This thereby minimises the need for an extensive grid network upgrade or long power line.

Environmental is a key aspect that Wonderheuveld Solar Power considers when evaluating a solar PV energy development. The proposed development should be developed in a sustainable and ecologically friendly manner ensuring its development has the least possible impact on the land on which it will be built.

Other key criteria which refine the site selection on a micro level include competition, topography and site access.

The proposed project site has a relatively flat topography, which is suitable for the development of a solar PV energy facility. The project site can be accessed easily via an existing dirt secondary road which connects to the tarred N10 national road.

The farms are currently used for agricultural purposes, specifically commercial sheep farming. The proposed development is not envisioned to impact farming activities after the construction phase had been completed. The site is therefore considered to be suitable from a land-use perspective.

#### **5.4 Local Need**

The Northern Cape Province faces numerous socio-economic and developmental challenges, which are not unique to the Province and are observed throughout the country. Reducing poverty through social development and achieving a sustainable economic growth in the Province through diversification and transformation of its economy are at the forefront of the provincial government's developmental objectives (Northern Cape Government, 2008; Office of the Premier of the Northern Cape, 2012).



The Northern Cape Province is endowed with biological diversity, mineral resources, and renewable energy sources such as solar and wind. Therefore, the achievement of its developmental objectives is envisaged to be done by capitalising on the local resources and specifically, the development of the agriculture and agro-processing, mineral extraction and mineral beneficiation, fishing and aquaculture, manufacturing, and tourism industries (Northern Cape Government, 2008; Office of the Premier of the Northern Cape, 2012).

Ensuring availability of inexpensive energy is seen to be fundamental to growing competitive industries in the Province (Northern Cape Government, 2008). However, provincial government advocates the development of the energy sector in the Province through '*the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments*' (Northern Cape Government, 2008). This implies the use of renewable energy sources and natural gas fields that the Province enjoys (Northern Cape Government, 2008). Provincial strategic documents specifically promote the development of large-scale renewable energy projects, similar to the one (1) under analysis, which among others, would contribute to renewable energy targets set by national government and allow to secure supply, tackle climate change and address the needs of the Province (Office of the Premier of the Northern Cape, 2012).

Harnessing renewables is also seen to contribute towards alleviation and reduction of poverty in the Province. One (1) of the interventions that underpin the provincial approach to poverty eradication is '*utilisation of natural resources in a sustainable manner*', which in turn implies the transition to greater exploitation of renewables, including solar (Northern Cape Government, 2008).

Considering the above, it can be concluded that the proposed development follows the provincial priorities and developmental objectives. From a spatial perspective, the proposed development also does not appear to raise any red flags.

The district and local municipality where the proposed solar PV energy facility is to be established also face similar challenges to the Province. Therefore, the municipalities' developmental priorities largely coincide. In like manner with the national and provincial policies, the district and local municipalities have placed considerable emphasis on the prioritisation and promotion of renewable energy resources within their boundaries. As previously mentioned, the IDP for the Pixley ka Seme District Municipality recognises the potential of renewable energy initiatives and states in its SDP that: '*The Pixley Ka Seme District area with its abundance of sunshine and vast tracts of available land has been attracting considerable interest from solar energy investors of late. The high solar index of the area, as indicated by the Solar Index Diagram, provides many opportunities in terms of the development of renewable energy. 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*' (Pixley Ka Seme District Municipality, 2014). The towns of Prieska and Carnarvon have in recent years changed character from small rural towns to potentially regional hubs as a result of investment in renewable energy generation. It should also be noted that as part Objective 5: Environmental sustainability and resilience, at least 20 000MW of renewable energy should be contracted by 2030. In addition, it is noted that the municipality has favourable conditions for renewable energy generation, a factor which gives it a possible competitive advantage from an economic perspective. The economy is also characterised by the potential of renewable energy resource generation. In terms of possible opportunities within the municipality, it has

been identified that there is a possibility to allow investment in renewable energy resource generation (Pixley ka Seme District Municipality IDP 2017-2022, 2017).

Based on the information above, it is evident that the proposed development fits well with the plans to diversify the provincial, district and local economies through investment in renewable energy developments.

## **6 DESCRIPTION OF THE RECEIVING ENVIRONMENT**

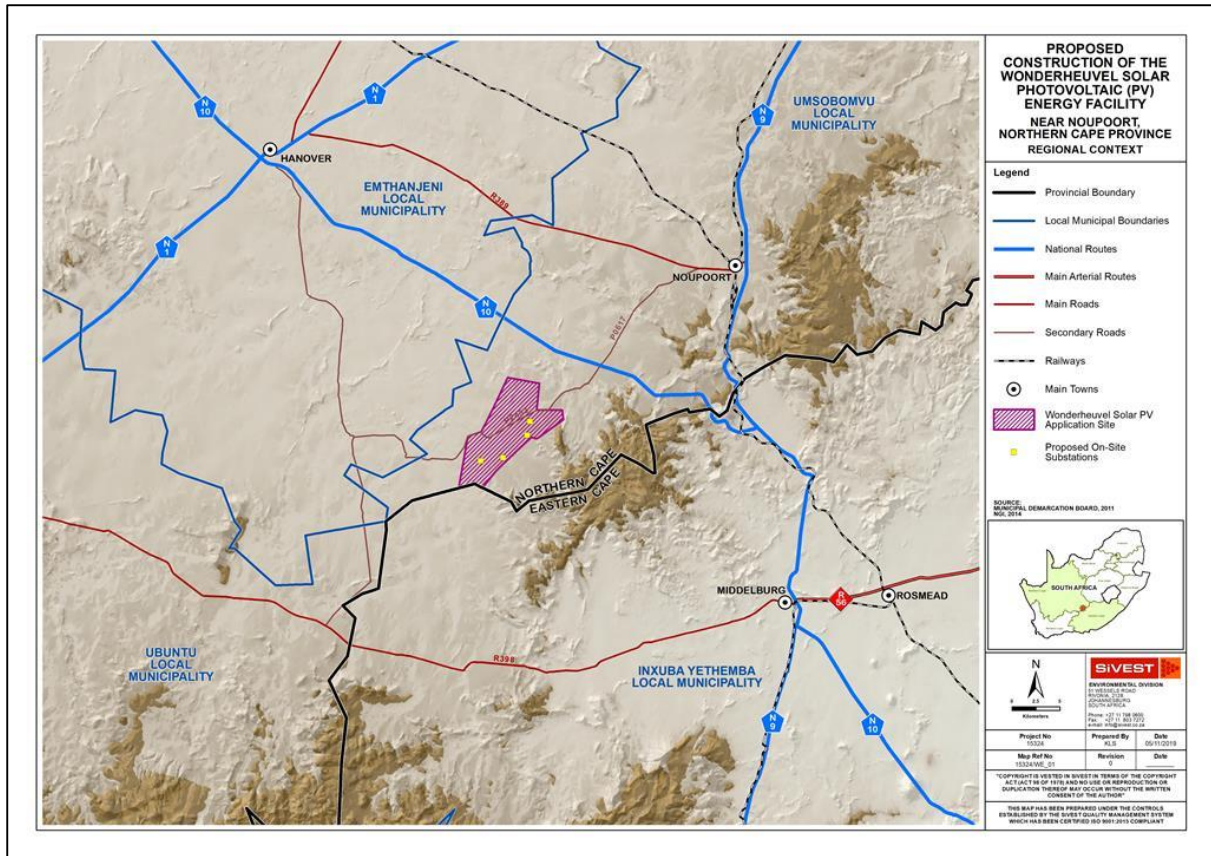
A general description of the study area is outlined in the sections below. The receiving environment in relation to each specialist study is also provided.

As mentioned, the specialists compiled one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects as well as the three (3) associated grid infrastructure developments (substations and 132kV power lines). Some of the sections below therefore provide a general description of the greater area surrounding the proposed PV project. Findings and impact assessment sections are however project-specific. The DEFF confirmed that this approach is acceptable during a pre-application meeting (refer to **Appendix 9B** for pre-application meeting minutes).

### **6.1 Regional Locality**

The proposed development will be located approximately 23km south-west of Noupoort in the Umsobomvu Local Municipality, which falls within the Pixley ka Seme District Municipality in the Northern Cape Province of South Africa (**Figure 12**). As mentioned, the proposed solar PV energy facility will be accessed by the N10 national road which lies north-east of the application site.

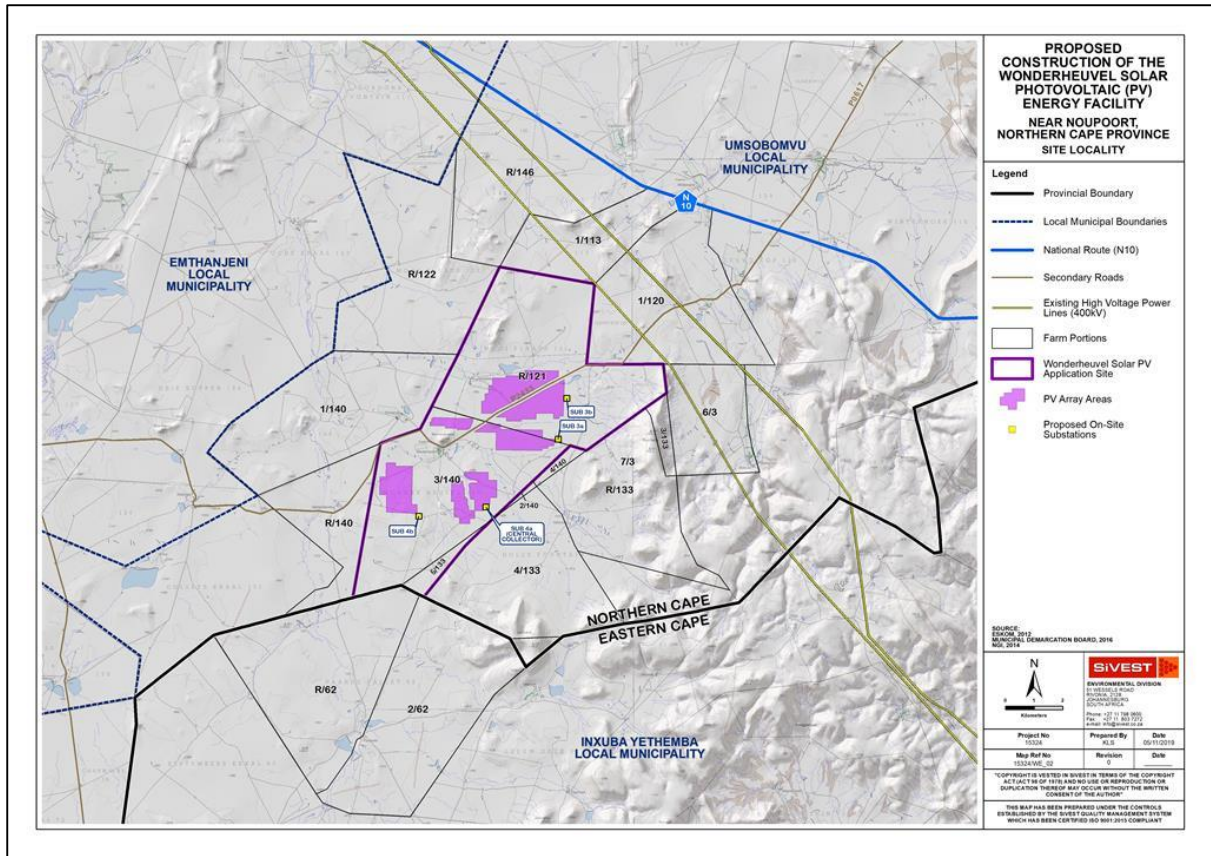
The centre point and corner coordinates for the proposed application site, as well as the centre point coordinates for the PV array areas, are included in **Table 11** and **Table 12** below.



**Figure 12:** Regional context of the Wonderheuvvel Solar PV Energy Facility

## 6.2 Study Site Description

The entire study area is largely in a natural state, but used for animal production. There is well-established farm infrastructure on each landholding, including homesteads, farm buildings, camps, dams, small areas of cultivated lands, and some stands of exotic trees used as shade and wind-screens. There are also access roads, narrow gravel roads, jeep tracks and fences. The vegetation in the study area is used primarily for livestock grazing and is affected to some degree by this usage, but not to the extent that any severe degradation was noted on-site. This natural pattern extends beyond the study area in all directions and gives the general area a sense of being relatively untransformed and largely natural.



**Figure 13:** Site locality

**Table 11:** Centre point and corner coordinates for the application site

<b>WONDERHEUVEL SOLAR PV ENERGY FACILITY: APPLICATION SITE</b>		
<b>CORNER POINT COORDINATES (DD MM SS.sss)</b>		
<b>POINT</b>	<b>SOUTH</b>	<b>EAST</b>
A	S31° 17' 1.287"	E24° 42' 4.865"
B	S31° 17' 20.791"	E24° 44' 9.956"
C	S31° 18' 52.051"	E24° 43' 59.011"
D	S31° 18' 51.516"	E24° 45' 40.385"
E	S31° 19' 24.462"	E24° 45' 44.745"
F	S31° 20' 29.169"	E24° 43' 58.727"
G	S31° 20' 23.791"	E24° 43' 37.331"
H	S31° 22' 16.277"	E24° 41' 19.097"
I	S31° 23' 14.558"	E24° 40' 23.671"
J	S31° 23' 1.162"	E24° 39' 53.952"
K	S31° 23' 15.310"	E24° 38' 49.721"
L	S31° 20' 20.615"	E24° 39' 26.979"
M	S31° 20' 4.494"	E24° 40' 19.428"

WONDERHEUVEL SOLAR PV ENERGY FACILITY: APPLICATION SITE		
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	SOUTH	EAST
P	S31° 20' 3.011"	E24° 41' 58.521"

**Table 12:** Centre point coordinates for the PV array areas

WONDERHEUVEL SOLAR PV ENERGY FACILITY: PV ARRAY AREAS		
CENTRE POINT COORDINATES (DD MM SS.sss)		
PHASE	SOUTH	EAST
PV ARRAY AREA 1	S31° 19' 20.917"	E24° 42' 27.573"
PV ARRAY AREA 2	S31° 19' 35.099"	E24° 42' 50.975"
PV ARRAY AREA 3	S31° 20' 14.911"	E24° 42' 26.343"
PV ARRAY AREA 4	S31° 19' 58.191"	E24° 41' 1.625"
PV ARRAY AREA 5	S31° 21' 11.854"	E24° 39' 50.368"
PV ARRAY AREA 6	S31° 21' 21.094"	E24° 41' 29.433"

*The PV array areas have a vast number of bend / corner point coordinates and therefore only the centre point coordinates have been provided in this report. A full list of all bend / corner point coordinates for the respective PV array areas is however provided in **Appendix 9A**.*

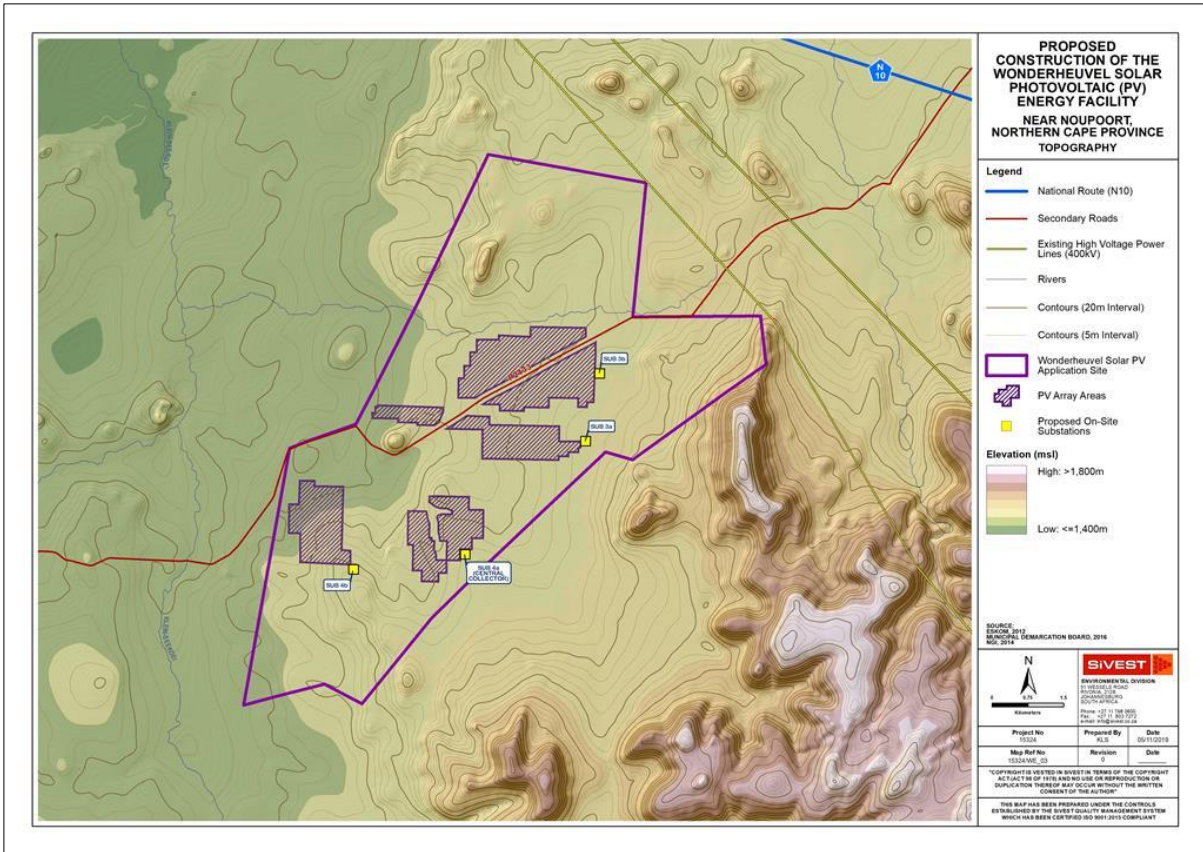
### 6.3 Topography

The study area is situated in an area along the boundary between plains and mountain ranges, with moderately to steeply sloping topography in the south-eastern parts, and relatively flat to undulating terrain in the remainder of the area. The elevation on-site varies from 1430 to 1855m above sea level, an elevation difference of approximately 425m across a distance of around 15,0km. The mountains rise fairly steeply from the surrounding plains resulting in much steeper gradients along this interface. The mountain areas are incised by steep valleys and are dissected and variable in topography. The plains are relatively flat to undulating, but with regular low ridges and koppies to break the landscape, some isolated and others linked into long, low ridges.

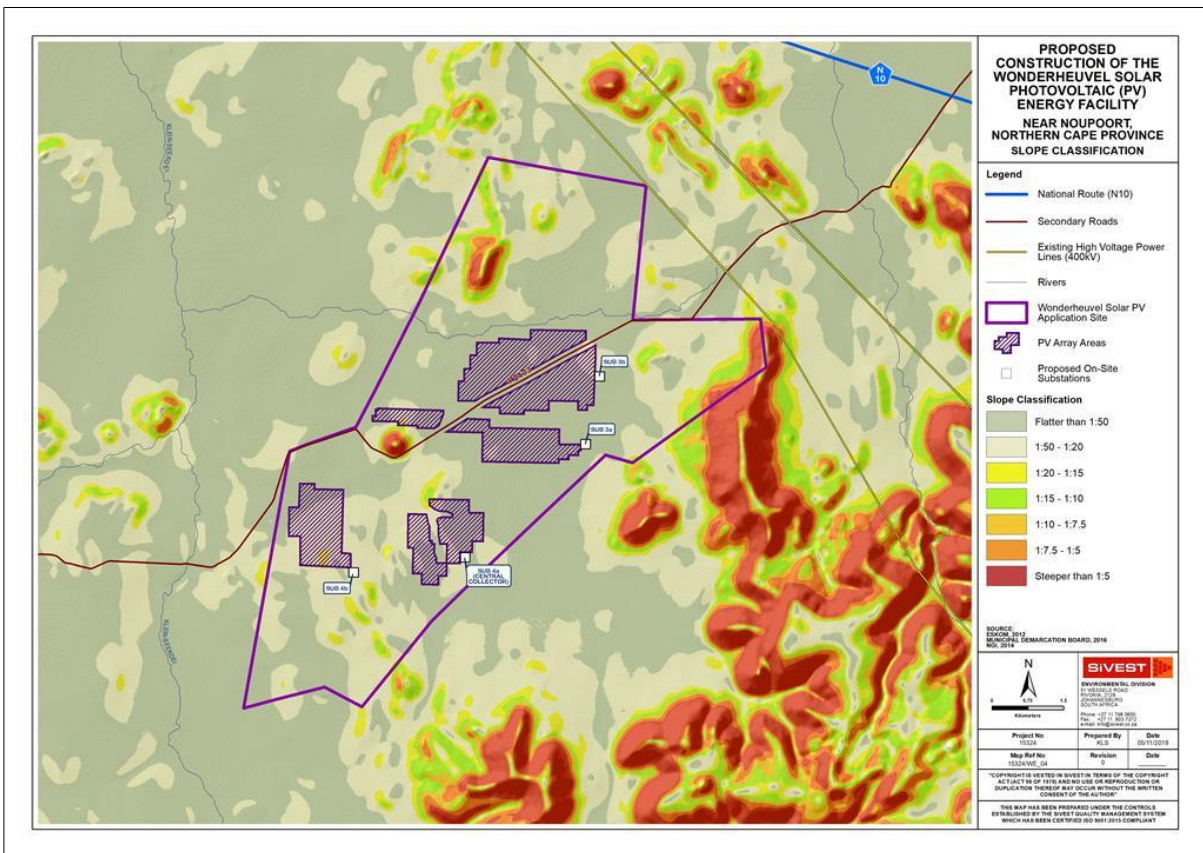
The topography within the application site is generally mildly undulating with a few localised ridges and koppies scattered across the site. There are a number of scattered outcrops/boulders across the site (especially in the north-western corner of the site). A hilly/ mountainous region was identified in the north-eastern section of the site. A prominent ridge was also identified in the north-western section of the site. Steep slopes may be expected in these areas.

The topography of the proposed site and surrounding area is shown in **Figure 14** below. The degree of slope of the site and surrounding area is shown in **Figure 15** below.





**Figure 14:** Topography of the study area



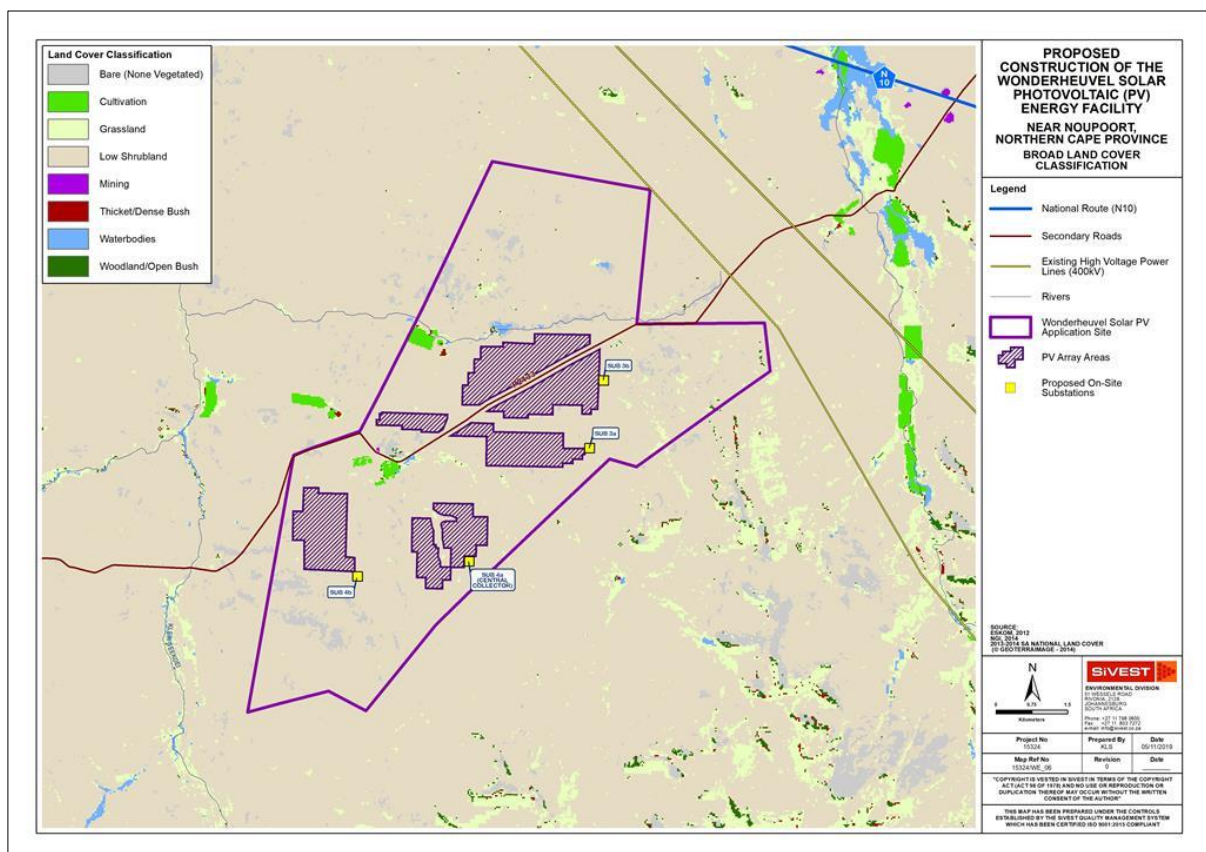
**Figure 15:** Degree of slope in region of the study area

## 6.4 Geology

The development area is underlain by a series of Karoo sandstones, mudstones and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales. The Beaufort Group covers a total land surface area of approximately 200 000km<sup>2</sup> in South Africa and is the first fully continental sequence in the Karoo Supergroup. The Beaufort Group is divided into the Adelaide subgroup and the overlying Tarkastad subgroup (Johnson *et al.*, 2006).

## 6.5 Land Use

Much of the land-use in the study area is characterised by low shrubland with large areas of grassland and smaller patches of woodland / open bush and thicket / dense bush occurring in the hilly areas in the eastern sector of the study area. Significant tracts of land in the study area are classified as 'bare (none vegetated)', and while some of these 'bare' areas are representative of transformation due to human activity, in many cases these patches of land are merely undisturbed areas with very sparse vegetation cover (**Figure 16**).



**Figure 16:** Land-use in the region of the study area

Agricultural activity in the area is restricted by the arid nature of the local climate and areas of cultivation are largely confined to relatively limited areas distributed along drainage lines. As such, the natural vegetation has been retained across much of the study area.

Livestock farming (mostly sheep) is the dominant activity, although the climatic and soil conditions have resulted in low densities of livestock and relatively large farm properties across the area. Thus, the area has a very low density of rural settlement, with relatively few scattered farmsteads in evidence.

Built form in much of the study area is limited to isolated farmsteads, including farmworker's dwellings and ancillary farm buildings, gravel access roads, telephone lines, fences and windmills.

Further human influence is visible in the area in the form of the N10 national route which traverses the study area in a north-west to south-east direction. In addition, there are several small patches of land scattered across the study area which are classified as 'Mines / Quarries'. These areas appear to be small quarries or 'diggings' and are mostly located adjacent to the public roads, especially along the N10.

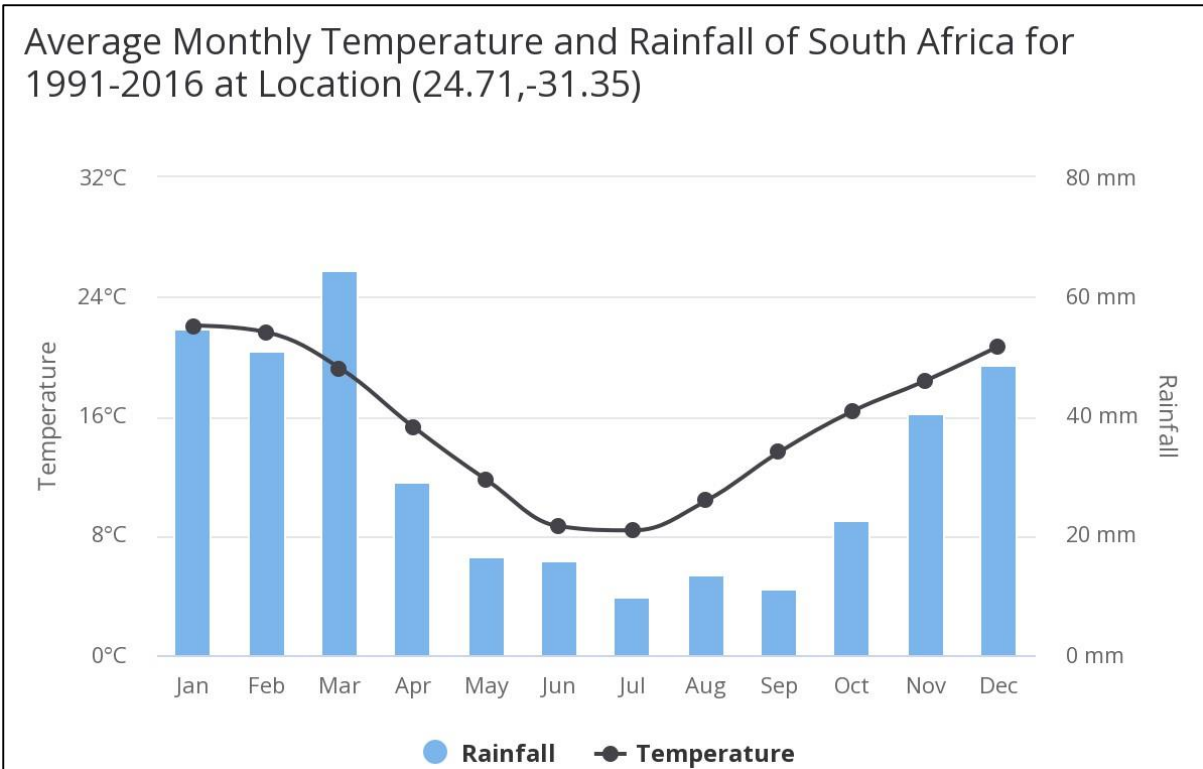
The closest built-up area is the town of Noupoort which is situated approximately 23km north-east of the Wonderheuvel application site. In addition, two (2) sets of high voltage (400kV) power lines traverse the northern section of the study area.

## **6.6 Climate**

The study area is within an arid environment. Rainfall for the site is given as a low 378 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). Rainfall can potentially occur at any time of the year, but is more likely in summer to late-summer, most often from October to April. Winters can be cold, with mean minimum temperatures approaching zero in July. Winter frost is common and occurs on average 30 days per year. In contrast, summers can be very hot with mean maximum temperatures in January exceeding 30°C.

The average monthly temperature and distribution of rainfall is shown in **Figure 17** below.





**Figure 17:** Average monthly temperature and rainfall for a position approximately in the centre of the development (The World Bank Climate Change Knowledge Portal, 2015)

## 6.7 Terrestrial Ecology

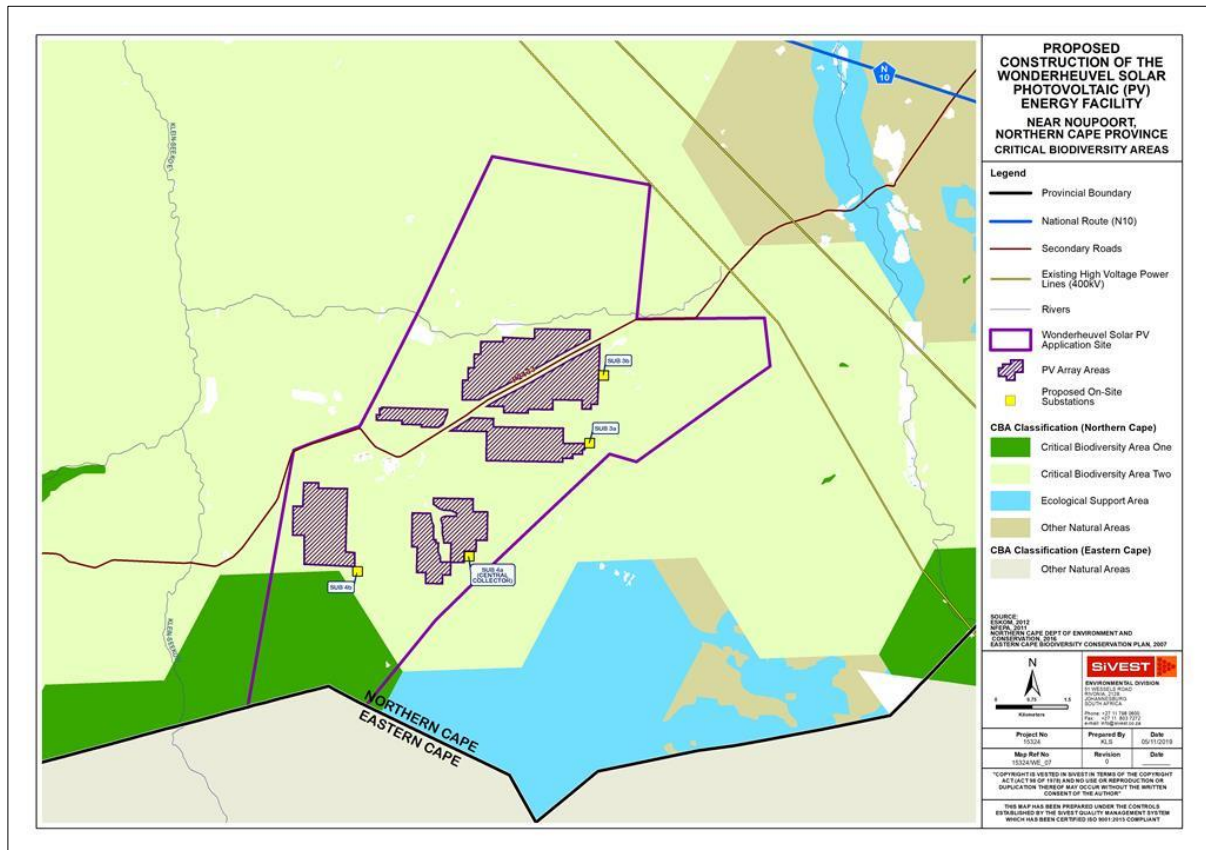
The Terrestrial Ecological Impact Assessment was conducted by Dr David Hoare and is included as **Appendix 6H**. The study commenced as a desktop-study, followed by a site-specific field study which was undertaken from the 4<sup>th</sup> – 8<sup>th</sup> of February 2019.

The environmental baseline from a terrestrial ecological perspective is presented below.

### 6.7.1 Broad Vegetation Patterns

There are two (2) regional vegetation types occurring in the study area, namely Eastern Upper Karoo and Besemkaree Koppies Shrubland. The first of these two (2) units (Eastern Upper Karoo) occurs across most of the study area, whereas the second (Besemkaree Koppies Shrubland) is restricted to the mountainous areas and is only affected by small proportions of the proposed infrastructure. There are three (3) additional units that occur in nearby areas, namely Southern Karoo Riviere (to the south-east of the application site), Tarkastad Montane Shrubland (small patches to the north-east, east and south-east of the application site) and Karoo Escarpment Grassland (to the north-east of the application site). It is possible that floristic components and/or plant community patterns related to any of these could extend locally into the study area.

The national vegetation map (Mucina & Rutherford 2006) for the study area is depicted below in **Figure 18** below.



**Figure 18:** The national vegetation map (Mucina & Rutherford, 2006) for the study area.

The vegetation types that occur in the study area and nearby areas are briefly described below.

### **Eastern Upper Karoo**

The vegetation occurs on flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast.

### **Besemkaree Koppies Shrubland**

Slopes of koppies, butts and tafelbergs covered by two-layered karroid shrubland. The lower (closed-canopy) layer is dominated by dwarf small-leaved shrubs and, especially in precipitation-rich years, also by abundant grasses, while the upper (loose canopy) layer is dominated by tall shrubs, namely *Rhus erosa*, *R. burchellii*, *R. ciliata*, *Euclea crispa subsp. ovata*, *Diospyros austro-africana* and *Olea europaea subsp. africana*.

### **Southern Karoo Riviere**

Narrow riverine flats supporting a complex of *Acacia karoo* or *Tamarix usneoides* thickets (up to 5 m tall) and fringed by tall *Salsola*-dominated shrubland (up to 1.5 m high), especially on heavier (and salt-

laden) soils on very broad alluvia. In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. Mesic thicket forms in the far eastern part of this region (see Van der Walt 1980: Table 4) may also contain *Leucosidea sericea*, *Rhamnus prinoides* and *Ehrharta erecta*.

### **Tarkastad Montane Shrubland**

Ridges, hills and isolated mountain slopes, characterised by high surface rock cover, this often consisting of large, round boulders. The vegetation is low, semi-open, mixed shrubland with 'white' grasses and dwarf shrubs forming a prominent component of the vegetation.

### **Karoo Escarpment Grassland**

Mountain summits, low mountains and hills with wiry, tussock grasslands, usually dominated by *Merxmuellera disticha*. Other common species include the grasses typical of dry grasslands (genera *Eragrostis*, *Tetrachne*, *Karroochloa*, *Helictotrichon*, *Melica*, *Tragus*, *Elionurus* and *Aristida*). An important low shrub component occurs throughout this grassland unit.

## 6.7.2 Conservation Status of Broad Vegetation Types

On the basis of a scientific approach used at national level by the South African National Biodiversity Institute (SANBI) (Driver *et al.*, 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie, 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale, the thresholds are as depicted in **Table 13** below, as determined by best available scientific approaches (Driver *et al.*, 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al.*, 2005).

<b>Determining ecosystem status (Driver <i>et al.</i>, 2005).</b> *BT = biodiversity target (the minimum conservation requirement).			
Habitat remaining (%)	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

**Table 13:** Conservation status of different vegetation types occurring in the study area

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver <i>et al.</i> 2005; Mucina <i>et al.</i> , 2006	National Ecosystem List (NEM:BA)
Eastern Upper Karoo	21	3	2	Least threatened	Not listed
Besemkaree Koppies Shrubland	28	5	3	Least threatened	Not listed
Southern Karoo Riviere	24	3	12	Least threatened	Not listed

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver <i>et al.</i> 2005; Mucina <i>et al.</i> , 2006	National Ecosystem List (NEM:BA)
Tarkastad Montane Shrubland	28	1	3	Least threatened	Not listed
Karoo Escarpment Grassland	24	3	3	Least threatened	Not listed

According to scientific literature (Driver *et al.*, 2005; Mucina *et al.*, 2006), as shown in **Table 13**, all regional vegetation types described here are listed as Least Threatened. The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. None of the vegetation types described here are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

### 6.7.3 Biodiversity Conservation Plans

The Northern Cape CBA Map was published in 2016 (Holness & Oosthuysen 2016) and it '*updates, revises and replaces all older systematic biodiversity plans and associated products for the province*'. This includes the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008), from which the Northern Cape CBA Map derived identified CBA1 and CBA2 areas (and added additional CBA1 and CBA2 areas). This is important, since the rationale for defining the recent (2016) CBA areas is derived from the earlier (2008) conservation plan. CBA1 and CBA2 areas in the 2016 map include the following areas:

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

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

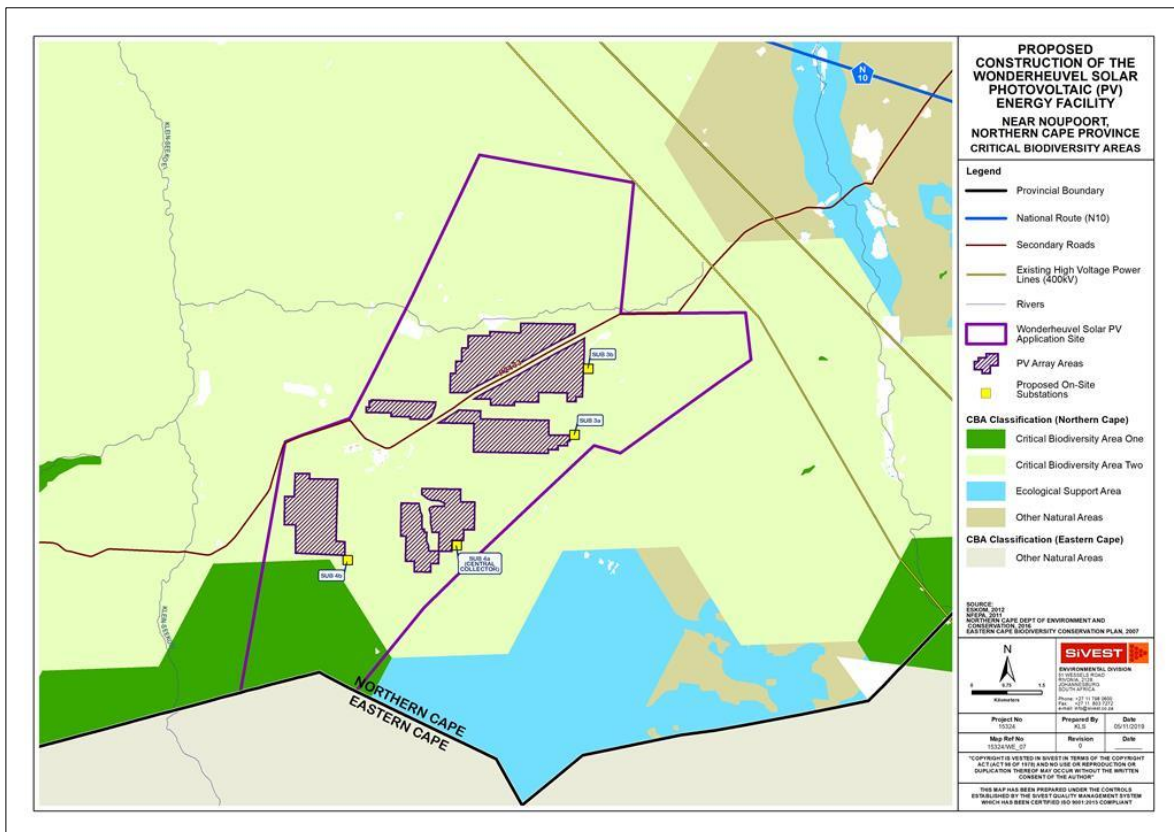
1. Protected;
2. Critical Biodiversity Area One (Irreplaceable Areas);

3. Critical Biodiversity Area Two (Important Areas);
4. Ecological Support Area; and
5. Other Natural Area.

This map shows features within the study area within three (3) of these classes, as follows:

1. Critical Biodiversity Areas (CBA): Most of the Wonderheuveld application site is within a CBA2 area, with one (1) patch of a CBA1 area in the south-western corner of the application site<sup>14</sup>;
2. Ecological Support Areas (ESA): The drainage valley in the extreme north-eastern part of the study area is within an ESA; and
3. Other Natural Areas (ONA): Areas surrounding the drainage valley in the north-eastern part of the study area are within an area mapped as ONA.

A map showing the CBAs and ESAs which can be found within the application site and broader study area is provided in **Figure 19** below.



**Figure 19:** Map showing Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

The presence of CBA areas 1 and 2 in the Wonderheuveld application site, indicate that these areas are considered important for biodiversity conservation in the Northern Cape. Additionally, the ESA in the northern half and to the south of the site indicate that the site has importance in a wider ecological context for supporting biodiversity patterns.

<sup>14</sup> Following comments from the DEFF's Biodiversity Conservation Department, the location for the laydown / staging areas, O&M buildings and Substation 4b were shifted to fall outside the CBA1 area (**Figure 19**)



The Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008) provides recommended guidelines for land-use activities within different CBA categories. Those that are relevant to the current project are as follows:

Land use	CBA1	CBA2	ESA	ONA
Major/extensive development projects	N	N	R	R
Linear engineering structures	R	R	R	R

N=No, not permitted, R=Restricted, only when unavoidable, not usually permitted.

In CBA1 areas, the land management objective is to maintain the area in a natural state with no biodiversity loss and no biodiversity offsets are possible for developments that result in the transformation of natural habitat. It is interpreted here that solar arrays would not be desirable within CBA1 areas, but that linear infrastructure could be constructed there, if impacts are comprehensively managed to avoid habitat loss or degradation.

In CBA2 areas the land management objective is to maintain the landscape in a near-natural state, possibly allowing some loss in ecosystem integrity and functioning. Biodiversity compatible land uses are strongly encouraged, and industries encouraged to adopt and implement acceptable biodiversity management plans. It is further recommended to restrict expansion of any activity that would cause loss of natural habitat and where possible utilise existing transformation or degraded areas for hard development. Biodiversity offsets are required where development impacts on land management objectives. This affects proposed solar arrays for all of Wonderheuwel.

It should be noted that the ecologist undertook a detailed site walkthrough of the project footprint to verify the relevance of the CBAs and ESAs. This was done to address any uncertainty in the coarse-scale delineation of CBAs and ESAs<sup>14</sup>.

#### 6.7.4 Red List Plant Species of the Study Area

Lists of plant species previously recorded in the study area were obtained from the SANBI website (<http://newposa.sanbi.org/>). These are listed in Appendix 3 of the Terrestrial Ecology Impact Assessment Report. There are very few collection records for this part of the country so a much larger area was searched for potential species of concern. Despite this broader search, there are very few species that were identified of conservation concern that could potentially occur in the broad area that includes the project area.

The list contains two (2) species listed in an IUCN threat category (Critically Endangered, Endangered or Vulnerable - see Table 3 in Terrestrial Ecology Impact Assessment Report) of which two (2) have a moderate possibility of occurring in the general area and in the type of habitats available in the study area. This does not mean that they will occur there, only that the review has identified that these are species that should be assessed as possibly occurring in the area. None of these species were encountered on site. The first of the two (2) species, *Gnaphalium simii*, listed as Data Deficient: taxonomic problems (DDT), would only occur in calcareous vleis, which could occur in any of the

drainage lines in the project area. The second species, *Trichodiadema rogersiae*, also listed as DDT, is found in mountain areas.

None of the species recorded on-site (see Appendix 3 of Terrestrial Ecology Impact Assessment Report) are listed in any threat category.

#### 6.7.5 Protected Plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 6 of the Terrestrial Ecology Impact Assessment Report. None of the species on this list were encountered on-site and none are considered likely to occur there, because they do not have a geographical distribution that includes the study area.

#### 6.7.6 Protected Plants (Northern Cape Nature Conservation Act)

Plant species protected under the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009) are listed in Appendix 5 of the Terrestrial Ecology Impact Assessment Report. Several species were found on-site that are protected according to the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009). From the field survey, this includes the following: *Ruschia intricata* (Aizoaceae), *Ruschia* species (Aizoaceae), *Trichodiadema setulifera* (Aizoaceae), *Pelargonium abrotanifolium*, *Pelargonium exhibens*, *Cotyledon orbiculata* (Crassulaceae), *Erica* species (Ericaceae), *Deverra denudata* (Apiaceae), and *Aloe broomii* (Asphodelaceae). Despite not being threatened, any impacts on these species will require a permit from the relevant authorities. Note that many of these species are widespread and not of any conservation concern, but protected due to the fact that the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009) protects entire families of flowering plants irrespective of whether some members are rare or common. The implication is that a comprehensive list of species occurring within the footprint of the proposed infrastructure is required and a permit application submitted for any of those listed as protected. The current list is therefore not considered to be complete and must be supplemented by a comprehensive walk-through survey, once the final footprint of infrastructure has been decided.

#### 6.7.7 Protected Trees

Tree species protected under the National Forest Act are listed in Appendix 2 of the Terrestrial Ecology Impact Assessment Report. There are none with a geographical distribution that includes the region in which the proposed development is located. There are two (2) species that have a geographical distribution that ends south of the study area, namely *Boscia albitrunca* and *Pittosporum viridiflorum*.

#### **Boscia albitrunca**

This is a small to medium-sized of up to 7m tall with a dense, roundish crown and smooth, white to greyish-white trunk. It is found in the drier parts of South Africa, as well as in the northern savanna parts of the country, but also extending some of the way down the eastern seaboard. There are scattered

records of this species in the general area that includes the project site, although it's main area of occurrence is further north. It is therefore possible that it could occur in the study area. However, no trees of this species were seen on-site and it is considered unlikely that it occurs there. In the unlikely event that it is found to occur there, it is unlikely that any more than a few individuals would be found.

### **Pittosporum viridiflorum**

This species occurs primarily in a band along the southern part of the country, extending up the east coast, where, from Lesotho northwards, it extends further inland. In the part of the country around the study area, the occurrence is generally south of the Great Escarpment, although there is one (1) record from Philipstown and two (2) from near Graaff-Reinet. It is considered unlikely that it occurs in the study area. In the unlikely event that it is found to occur there, it is unlikely that any more than a few individuals would be found.

In summary, no species of protected trees were found or are likely to occur in the geographical area that includes the site.

### **6.7.8 Vertebrate Animal Species of the Study Area**

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

#### **Mammals**

There are 79 mammal species that have a geographical distribution that includes the study area, of which eleven (11) are listed in a conservation category of some level (see Appendix 3 of Terrestrial Ecology Impact Assessment Report). This is a relatively moderate diversity of mammals compared to other parts of South Africa. Based on the natural state of the study area and surrounding areas, it is considered likely that some of these species could occur on site. Listed species with a geographical range that includes the site are discussed in more detail below to evaluate the potential for them to occur on-site.

- **Black Rhinoceros**

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

- **Grey Rhebok**

The Grey Rhebok (*Pelea capreolus*), listed as Near Threatened, is endemic to South Africa, Lesotho and parts of Swaziland. In the south and southwest, their distribution is associated with the rocky hills of mountain Fynbos and the Little Karoo (Taylor *et al.*, 2016). They are predominantly browsers, feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food (Taylor *et al.*, 2016). Local declines in their population have been attributed to increased



densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. It has not been recorded in the grid in which the site is located, but has been recorded in the grid to the north-east and many grids further to the south, so the site is within the overall distribution range of the species. There is therefore a moderate likelihood that it could occur on-site within any suitable habitat. However, it is a relatively mobile species and not necessarily dependent on any particular habitat. It is likely to move away from the path of any construction and development of parts of the study area. **The proposed development is therefore highly unlikely to have any negative effect on the species, even though it could possibly occur there.**

- Black-footed Cat

The Black-footed Cat (*Felis nigripes*), listed as Vulnerable, has been previously recorded in the grid in which the project is located, as well as in most surrounding grids. It's known distribution is on the inland part of most of South Africa, but seemingly not within the winter-rainfall part of the country. It also occurs in Botswana and Namibia. The current project area is within the core of the distribution range of the species and the species is therefore highly likely to occur in the area. The species is nocturnal and carnivorous, favouring any vegetation cover that is low and not too dense. They make use of dens in the daytime, which can be abandoned termite mounds, or dens dug by other animals, such as aardvark, springhares or cape ground squirrels. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. They are highly vulnerable to domestic carnivores. The study area is definitely suited to this species and it probably occurs there. It is possible that it has interbred with cats on the farm – two (2) kittens seen on-site had colour characteristics of this species, such as black paws and markings similar to black-footed cats. **The proposed development may possibly have a negative effect on the species.**

- Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. In montane and rocky areas of the Eastern, Western and Northern Cape, they prey on dassies and klipspringers. They have large home ranges, but do not migrate easily, males having ranges of about 100km<sup>2</sup> and females 20km<sup>2</sup>. It has not been recorded in any of the adjacent or nearby grids and the overall distribution shows a gap in its distribution that includes the current study area. There is therefore a low probability of this species occurring on-site, and if it did occur there it would probably be at very low densities. **The proposed development could possibly displace individuals, in the unlikely event that they occur there, but is unlikely to have a significant effect on overall population densities.**

- Cape Clawless Otter

The Cape Clawless Otter (*Aonyx capensis*), listed as Near Threatened, is widely but patchily distributed throughout South Africa, and is also the most widely found otter in Africa. It is aquatic and seldom found far from permanent water, which needs to be fresh. They may be found in seasonal rivers in the Karoo, provided suitable-sized pools persist. The site is within the known distribution of this species and there are historical records for one (1) adjacent grid to the south, although not from the current grid. There is suitable habitat for this species on-site. Paw-prints in the mud adjacent to water on-site were identified as belonging to an otter and it is considered most likely that it would be this species. The area where it occurs is in the power line corridor associated with the Hydra D MTS, which is an option for the project. **It is therefore considered definite that it occurs on-site and that individuals could be affected by construction activities, if suitable habitat is damaged.**

- African Striped Weasel

The African Striped Weasel (*Poecilogale albinucha*), listed as Near Threatened, is found throughout most of South Africa, except for the arid interior, and into central Africa (excluding Namibia). It has not been recorded in the grid in which the site is located or any surrounding grid, but the site is within the overall distribution range for the species. It is found primarily in moist grasslands and fynbos, where adequate numbers of prey may be found. **It is considered unlikely to occur in the study area and the proposed development will therefore not affect this species.**

- Brown Hyaena

The Brown Hyaena (*Hyaena brunnea*), listed as Near Threatened, is found in a band running down the centre of the country, expanding into the entire northern parts of the country. There is a gap in the distribution around the current study area, but there is a possibility that vagrant individuals could extend into this area. The species is found in desert areas, particularly along the west coast, semi-desert, open scrub and open woodland savannah (Mills & Hes, 1997). It is a solitary scavenger that travels vast distances every day in search of food. It has a medium chance of occurring in the study area since the distribution range includes the study area, however there are no historical records from nearby. It is a mobile animal that is likely to move away from the path of any construction and development of parts of the site is therefore highly unlikely to have any negative effect on the species. **It is considered that there is a low likelihood of it occurring on-site or that individuals could be affected by construction activities.**

- South African Hedgehog

The South African Hedgehog (*Atelerix frontalis*), listed as Near Threatened, is found in a large part of the central part of South Africa, extending down to the south-eastern coast, and is also found in Namibia, Botswana, Zimbabwe, Lesotho and Swaziland. It requires ample ground cover for cover, nesting and foraging and prefers dense vegetation and rocky outcrops. The site is well within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. **It is considered likely that it could occur on-site and individuals could be affected by construction activities, if suitable habitat is damaged.**

- White-tailed Rat

The White-tailed Rat (*Myxomys albicaudatus*), listed as Vulnerable, is endemic to South Africa and Lesotho, where it is found primarily in Highveld grasslands, but extending into adjacent Fynbos and Karoo areas. It is terrestrial, but never found in soft, sandy substrates, rocks, wetlands or river banks, and do not occur in transformed habitat. The study area is on the edge of the known distribution of this species, but there are historical records for the grid in which the projects are located, as well as two (2) adjacent grids. There is therefore a high probability of the study area being suitable for this species. **It is considered likely that it could occur on-site and individuals could be affected by construction activities, if suitable habitat is damaged.**

- Vlei Rat

The Vlei Rat (Grassland-type) (*Otomys auratus*), listed as Near Threatened, is near-endemic to South Africa, occurring in the north-eastern half of the country, associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions. It is likely to be associated with sedges and grasses

in densely-vegetated wetlands with wet soils. The study area is on the very edge of the known distribution of this species and there are no historical records for grid in which the study area is located, not any adjacent grids. There is therefore a low probability of the study area being suitable for this species. **It is considered unlikely that it occurs on-site and the proposed development will therefore probably not affect this species.**

- Spectacled Dormouse

The Spectacled Dormouse (*Graphiurus ocellaris*), listed as Near Threatened, is endemic to South Africa, where it is found in the Northern, Eastern and Western Cape Provinces. It is associated with rock piles, crevices, outcrops and stone kraals. They may be territorial. The study area is within the known distribution of this species and there are historical records for three (3) adjacent grids to the north, north-east and east, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area. **It is considered likely that it could occur on-site and individuals could be affected by construction activities, if suitable habitat is damaged.**

Of the species currently listed as threatened or protected (see Appendix 5 of Terrestrial Ecology Impact Assessment Report for list of protected species), those listed in **Table 14** below are considered to have a probability of occurring on-site and being potentially negatively affected by proposed activities associated with the proposed development.

**Table 14:** Mammal species of conservation concern with a likelihood of occurring on site

Scientific name	Common name	Status	Likelihood of occurrence
<i>Felis nigripes</i>	Black-footed Cat	Vulnerable, protected	Very High
<i>Aonyx capensis</i>	Cape Clawless Otter	Near Threatened, protected	Very high
<i>Atelerix frontalis</i>	South African Hedgehog	Near Threatened, protected	High
<i>Pelea capreolus</i>	Grey Rhebok	Near Threatened, protected	Medium
<i>Mystromys albicaudatus</i>	White-tailed Rat	Vulnerable	Medium
<i>Graphiurus ocellaris</i>	Spectacled dormouse	Near Threatened	Medium
<i>Panthera pardus</i>	Leopard	Vulnerable, protected	Low
<i>Poecilogale albinucha</i>	African Striped Weasel	Near Threatened	Low
<i>Hyaena brunnea</i>	Brown hyaena	Near Threatened	Low
<i>Otomys auratus</i>	Vlei Rat	Near Threatened	Low

### Reptiles

A total of 55 reptile species have a geographical distribution that includes the study area in which the project site is found (Alexander & Marais 2007, Bates *et al.* 2014, Branch 1988, Marais 2004, Tolley & Burger, 2007). This is a moderate diversity compared to average diversity in other parts of the country.

Of the reptile species that could potentially occur in the study area, none have been listed in a threat category.

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

### **Amphibians**

A total of only ten (10) frog species have a geographical distribution that includes the general study area in which the project site is found (Du Preez & Carruthers, 2009). Some of these species are only marginally present in the study area due to the fact that their distribution range ends close to the study area. Of the frog species that could potentially occur in the study area, none are listed in a threat category, but one (1) species is listed as protected, according to National legislation, the Giant Bullfrog.

- **The Giant Bull Frog**

The Giant Bull Frog (*Pyxicephalus adspersus*) previously listed as Near Threatened, is found in seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna and, at the limits of its distribution, in Nama Karoo and thicket. For most of the year the species remains buried up to 1m underground. They emerge only during the peak of the rainy season to forage and breed. If conditions are extremely dry, they may remain cocooned underground for several years. Long distances often separate suitable breeding sites. In order to breed, they require shallow, rain-filled depressions that retain water long enough for the tadpoles to metamorphose. Before and after breeding, bullfrogs forage in open grassland, feeding mostly on insects, but also on other frogs, lizards, snakes, small birds and rodents. After breeding males generally bury themselves within 100m of the breeding site, but females may disperse up to 1km away. Based on habitat requirements, there is a medium probability that this species occurs in the study area.

It is concluded that the site contains habitat that is suitable for various frog species, although only one (1) species of conservation concern is likely to occur in the study area. One (1) frog species of concern is therefore potentially likely to be affected by development in the study area, including the proposed project, as shown in **Table 15** below.

**Table 15:** Amphibian species of conservation concern with a likelihood of occurring on site

<b>Scientific name</b>	<b>Common name</b>	<b>Status</b>	<b>Likelihood of occurrence</b>
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	Protected	Medium

#### 6.7.9 Protected Animals

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

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 6 of the Terrestrial Ecology Impact Assessment Report, marked with the letter “N”. This includes the following species: Black Rhinoceros (does not occur on-site), Black-footed Cat, Leopard (probably does not occur on-site), Cape Clawless Otter, Cape Fox, South African Hedgehog, Brown Hyena and Giant Bullfrog.

Due to habitat and forage requirements, and the fact that some species are restricted to game farms and/or conservation areas, only the Black-footed Cat, Cape Clawless Otter, Cape Fox, South African Hedgehog, and Giant Bullfrog have any likelihood of occurring on-site. Most of these species are territorial with small home ranges or may be dependent on specific habitat to exist on-site. They could therefore be affected by the development of the proposed project.

#### 6.7.10 Habitats on-Site

It should be noted that transformed areas where no vegetation occurs were insignificant in area. This included roads, farm buildings and similar existing disturbances. The broad natural habitat units on-site are as follows:

1. Lowland plains vegetation (karroid dwarf shrubland);
2. Mountain vegetation (shrubland);
3. Low ridges (shrubland);
4. Broad drainage areas; and
5. Mountain stream.

#### **Lowland plains vegetation**

The general study area is characterised by a low succulent, dwarf shrubland, typical of the regional vegetation type, Eastern Upper Karoo, which is described as 'dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis*' (Mucina & Rutherford 2006). A typical view of this vegetation, as found on-site, is shown in **Figure 20** below. This was the most widespread vegetation community on-site, occurring on all the relatively flat plains areas.



**Figure 20:** Photo showing Nama-karoo vegetation on plains with steeper topography in background

The general floristic character of this vegetation on-site is fairly uniform across wide areas, often dominated by the same suite of species, including *Ruschia intricata*, *Aristida diffusa*, *Tragus koelerioides*, *Eragrostis lehmanniana*, *Amphiglossa triflora*, *Wahlenbergia nodosa*, *Lycium cinereum*, *Pteronia glomerata*, *Pteronia mucronata*, *Chrysocoma ciliata* and *Eriocephalus spinescens*. However, any local variation in topography can lead to localised increase in richness associated with a more diverse species composition.

### **Mountain vegetation**

This vegetation is somewhat typical of Besemkaree Koppies Shrubland, described above, in terms of structure, species composition and location in the landscape, with the exception of having the common presence of the grass, *Tenaxia stricta*, which is more expected in Karoo Escarpment Grassland. The vegetation community is found in all the more significant mountains in the study area, with steep topography and higher elevation than the surrounding plains. At the time of the field survey, most of these mountain areas had been recently burnt, but unburnt patches showed a consistency in species composition and structure across the study area that suggested that observed patterns could be generally extrapolated to burnt areas. An example is shown in **Figure 21** below.





**Figure 21:** Shrubby vegetation in unburnt mountainous areas in the study area

This species composition and structure included a shrub layer dominated by woody species, such as *Searsia erosa*, *Euclea crispa*, *Felicia filifolia*, *Elytropappus rhinocerotis*, *Diospyros lycioides*, *Tarchonanthus minor*, and *Diospyros austro-africanus*, and a grass layer dominated by *Tenaxia stricta*, along with *Themeda triandra*, *Erioccephalus ericoides*, *Chrysocoma ciliata*, *Ehrharta calycina*, *Cheilanthes eckloniana* and *Cymbopogon pospischilii*. There is likely to be some ecological variation in structure and species composition in different parts of the landscape, although this could not be verified within burnt vegetation. The topography introduces variation in slope and aspect, with some slopes facing hotter northern or western directions and others facing cooler southern and eastern directions, all of which introduces ecological variation into the landscape, providing new habitats for different species. Due to the sedimentary origin of the substrates, there are often bands of more resistant rock layers at specific heights on the mountain slopes. These substrates manifest themselves as small cliffs and rocky outcrops. There is a known diversity relationship between increased surface rockiness and increased local floristic species richness, which is likely to be true for the current study area. This generalisation is supported by the fact that many of the rarer floristic sitings on-site were within rocky areas.

### **Low ridges and koppies**

There are low ridges and koppies scattered throughout the plains area of the study area. They appear to mostly be associated with dolerite outcrops. The soils in these areas are mostly shallow and rocky, there are often more boulders and the vegetation consists of a distinct open shrub canopy with a sparse grassy understorey. The floristic diversity is slightly higher in these areas than in surrounding plains and the structure of the vegetation almost certainly provides shelter and refuge for animals. Common shrubs on these ridges include *Rhus erosa*, *Euclea crispa*, *Lycium cinereum*, *Diospyros austro-africana* and *Diospyros lycioides*. The species composition is not similar to any of the main vegetation units described for the study area and surrounding areas, but is probably most similar to *Tarkastad Montane Shrubland*.

An example of typical vegetation found on low ridges is shown in **Figure 22** below.



**Figure 22:** Typical habitat on low ridges and koppies in the study area

### **Broad drainage areas**

There is a network of shallow drainage areas throughout the lower-lying parts of the study area. These are sometimes indistinct from surrounding areas, but often resolve into channels, or include areas with woody shrubs. It also includes bare areas, erosion gullies, and empty farm dams (at the time of the survey). Most of the homesteads in the study area are built on or adjacent to drainage areas, including buildings, roads, camps and often stands of exotic trees, some of which are dense and fairly substantial in extent. The small amount of formal cultivation also occurs almost entirely within this unit.

The unit is equivalent to the vegetation unit, Southern Karoo Riviere, although there is considerable variation from one (1) part of the study area to another: in the wide open plains, the vegetation on-site is more in line with the description for Southern Karoo Riviere, but closer to hills, it becomes more grassy, but with the inclusion of typical wetland species, such as *Afroscirpoides dioeca*, *Pseudoschoenus inanis* and *Juncus rigidus*. Some areas where permanent channel formation had taken place were almost completely dominated by the robust grass, *Miscanthus ecklonii*, along with *Pennisetum sphacelatum* and *Searsia pyroides*. Where these channelled systems were larger and approaching being more perennial in terms of water presence, there was increasing dominance by woody species, such as *Diospyros lycioides*, *Helichrysum trilineatum*, *Melianthus comosus*, *Lycium cinereum*, *Deverra burchellii*, *Asparagus laricinus* and *Diospyros austro-africana*.

A typical view of this more structurally developed habitat is shown in **Figure 23** below.





**Figure 23:** Typical drainage line habitat in the study area

The drainage areas are important habitat for animals, providing refuge and shelter, water, when it is available, palatable vegetation, when surrounding areas are in drought, and softer and deeper soils for burrowing animals. The habitat is also an important flood-attenuation component of the landscape, and a reservoir for soil water. If it occurs on-site, this is the habitat in which the protected Giant Bullfrog would be found.

### **Mountain stream**

Strictly, this is part of the broad drainage area in the study area, which varies from broad, wide areas with no aquatic characteristics, to semi-permanent pools, but is discussed separately due to the fact that they are within the mountains and have different characteristics to other parts of the landscape. The mountain stream map unit occurs only in the eastern part of the study area in the mountains, and is part of a valley that eventually exits into a wider drainage valley, as described in the previous section. Within the mountains, the stream is contained by the surrounding rocky mountain slopes, has a rocky bed with sandy banks in places, and consists of permanent wetlands, aquatic habitats, rocky slabs and other micro-habitats.

A typical view is shown in **Figure 24** below.



**Figure 24:** Mountain stream habitat

The riparian areas have a species composition and structure that is almost completely different to the surrounding landscape. The habitat contains a combination of bare rock and deeper sands, so it is able to support a flora that is adapted to these substrate conditions, in addition to the sporadic flooding and scouring that takes place in these habitats as a result of rare large rainfall events. Although not necessarily floristically sensitive, the habitat that is derived under these ecological conditions is critically important for fauna, providing food and shelter as well as corridors for undetected movement. In times of drought, riparian areas may offer the only slightly green vegetation as a source of food. The deeper sands are important for burrowing animals and the shrubs and low trees offer shelter and browse.

Riparian habitats are disproportionately important in terms of the proportion of the area that they occupy in the landscape – they provide a unique and important habitat for both flora and fauna in this arid part of the country. The plant species occurring within these habitats are not necessarily rare in a global sense, but the degradation of this interconnected system can cause floristic loss and change in areas far removed from any impact. For this reason, and for the utilitarian importance to fauna, the riparian vegetation is considered to be ecologically sensitive. In addition, this is the habitat in which the Near Threatened and nationally protected Cape Clawless Otter is found on-site.

#### *6.7.11 Habitat Sensitivity*

To determine ecological sensitivity in the study area, local and regional factors were taken into account. There are some habitats in the study area that have been described as sensitive in their own right, irrespective of regional assessments. This includes the stream beds and associated riparian zones and adjacent floodplains primarily. A detailed assessment of these areas has been undertaken by an aquatic specialist and they are only considered here in terms of being an important habitat for flora and fauna. Mountain areas and steep slopes, especially at higher elevations are more sensitive than surrounding

areas, mainly due to higher floristic diversity and the likelihood of plant species with low local abundance occurring there.

At a regional level, the CBA map for Northern Cape indicates various parts of the study area as being important for conservation. There are patches of CBA1 in the eastern and western parts of the study area. In addition, the southern section of the application site encroaches onto a CBA1. It is speculated that these are the location of species of concern, although this is not confirmed from any other information and the assumption is therefore speculative. Most of the remainder of the study area is CBA2, indicating regional importance for the entire escarpment region in which the study area is located. It should be assumed that, over and above the designation of CBAs in other parts of the study area, all high-lying areas should be treated as ESAs. This coincides with the areas mapped as Mountain Vegetation.

In terms of other species of concern, including both plants and animals (with the exception of the Cape Clawless Otter that has already been discussed in the Terrestrial Ecology Impact Assessment Report), there are no specific locations where conservation of habitat would benefit a specific species based on the existing data available. All mammal species of concern and all protected plant species described in the Terrestrial Ecology Impact Assessment Report could occur on any part of the site, whether in the mountains or on the lowlands, although it is probable that low ridges and drainage areas are of more importance than plains areas.

A summary of sensitivities that occur on-site and that may be vulnerable to damage from the proposed development are as follows:

1. Drainage areas;
2. Mountain stream;
3. High-lying areas (i.e. mountain vegetation); and
4. CBA areas, especially CBA1.

The main habitat sensitivity classes on-site are as follows:

1. MEDIUM-LOW for lowland plains vegetation outside of CBAs. In the absence of CBAs, all lowland plains on-site would be within this sensitivity class.
2. MEDIUM for all rocky ridges and drainage areas outside of CBAs. In the absence of CBAs, all rocky ridges and drainage areas would be within this sensitivity class.
3. MEDIUM-HIGH for mountain areas outside of CBAs.
4. HIGH for CBA1 areas, and mountain areas surrounding aquatic habitat where the Cape Clawless Otter occurs. The aquatic habitat and surrounding mountain slopes would be within this sensitivity class in the absence of the CBA1 classification.
5. VERY HIGH for aquatic habitat where the Cape Clawless Otter occurs and a buffer, also inside a CBA1 area.

## 6.8 Avifaunal

The Avifaunal Specialist Study is currently was conducted by Chris van Rooyen. The Avifaunal Specialist Study Report is included as **Appendix 6B**. A desktop investigation was conducted to source information on the impacts of the proposed solar PV energy facility on avifauna. A visit to the site and general area was conducted on 15 and 16 January 2019, followed up by on-site surveys from 17 - 19 January and 9 – 12 May 2019. Surveys were conducted according to the best practice guidelines for avifaunal impact studies at solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins et al., 2017). Refer to Appendix 1 of the Avifaunal Specialist Study Report for the methodology used in the surveys.

### 6.8.1 Baseline Assessment

#### 6.8.1.1 Important Bird Areas

The Platberg-Karoo Conservancy Important Bird Area (IBA) SA037 is located approximately 3-4km north-west of the study area. The Platberg–Karoo Conservancy IBA covers the entire districts of De Aar, Philipstown and Hanover, including suburban towns. The landscape consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. The ephemeral Brak River flows in an arc from south-east to north-west, eventually feeding into the Orange River basin. Other ephemeral rivers include the Hondeblaf, Seekoei, Elandsfontein and Ongers rivers with a network of tributaries. Vanderkloof Dam is on the north-eastern boundary (Marnewick *et al.*, 2015).

This IBA is in the Nama Karoo and Grassland Biomes. The eastern Nama Karoo has the highest rainfall of all the Nama Karoo vegetation types and is thus ecotonal to grassland, with a complex mix of grass- and shrub-dominated vegetation types. Eight (8) broad vegetation types are present; seven (7) are Least Threatened and the Upper Gariep Alluvial Vegetation type is classified as Vulnerable (Marnewick *et al.*, 2015).

The land is used primarily for grazing and agriculture. Commercial livestock farming is mostly extensive wool and mutton production, with some cattle and game farming. Less than 5% of this IBA is cultivated under dryland or irrigated conditions and includes Lucerne and prickly pear (*Opuntia ficus-indica*) orchards (Marnewick *et al.*, 2015).

This IBA contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane (*Anthropoides paradiseus*), Ludwig's Bustard (*Neotis ludwigii*), Kori Bustard (*Ardeotis kori*), Blue Korhaan (*Eupodotis caerulescens*), Black Stork (*Ciconia nigra*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Verreauxs' Eagle (*Aquila verreauxii*) and Tawny Eagle (*A. rapax*) (Marnewick *et al.*, 2015).

In summer, close to 10% of the global population of Lesser Kestrels (*Falco naumanni*) roost in this IBA. Amur Falcons (*F. amurensis*) are also abundant and forage and roost with Lesser Kestrels. This IBA is seasonally important for White Stork (*Ciconia ciconia*), with high numbers of this species recorded during outbreaks of brown locusts (*Locustana pardalina*) and armoured ground crickets (*Acanthoplus discoidalis*) (Marnewick *et al.*, 2015).

IBA trigger species are the globally threatened Blue Crane, Ludwig's Bustard, Kori Bustard, Secretarybird, 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 Verreaux's Eagle (Marnewick *et al.*, 2015).

Biome-restricted species include Karoo Lark (*Calendulauda albescens*), Karoo Long-billed Lark (*Certhilauda subcoronata*), Karoo Chat (*Cercomela schlegelii*), Tractrac Chat (*C. tractrac*), Sicklewinged Chat (*C. sinuate*), 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.

Due to the proximity of the IBA to the study area, it is possible that the proposed development could impact on some of the trigger species in the IBA. Far-ranging birds that move in and out of the IBA could be impacted, namely power line sensitive species such as Blue Crane, Ludwig's Bustard, Kori Bustard, Black Stork, Secretarybird, Martial Eagle, Verreaux's Eagle and Tawny Eagle.

#### 6.8.1.2 Habitat Classes

Vegetation structure, rather than the actual plant species, is more significant for bird species distribution and abundance (Harrison *et al.*, 1997). The description of the vegetation types occurring in the study area largely follows the classification system presented in the Atlas of southern African birds (SABAP1) (Harrison *et al.*, 1997). The criteria used to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird / vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. The description of vegetation presented in this study therefore concentrates on factors relevant to the bird species present and is not an exhaustive list of plant species present.

Whilst the distribution and abundance of the priority bird species in the study area are closely tied to natural features (e.g. vegetation structure and topography / relief), it is also necessary to examine external modifications to the environment that might have relevance for priority species. Anthropogenic avifaunal-relevant habitat modifications which could potentially influence the avifaunal community that were recorded in or close to the study area are dams and water reservoirs, high voltage transmission lines, agriculture, fences and alien trees. The habitat classes are discussed in more detail below.

The solar priority species associated with each habitat class are listed in **Table 16** below.

**Table 16:** Solar priority species potentially occurring at the site, conservation status, priority criteria, SABAP reporting rates, probability of occurrence, habitat use and potential impacts

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Avocet, Pied	<i>Recurvirostra avosetta</i>	x	15.48					Low			x						x			
Bustard, Ludwig's	<i>Neotis ludwigii</i>	x	25.67	EN	EN		Near-endemic	High	x	x					x			x	x	x
Buzzard, Jackal	<i>Buteo rufofuscus</i>	x	22.22			Near endemic	Endemic	High	x	x	x	x	x	x	x	x	x	x		
Canary, Black-headed	<i>Serinus alario</i>	x	14.56			Near endemic	Endemic	Low		x	x					x	x	x		
Chat, Sickle-winged	<i>Cercomela sinuata</i>	x	48.81			Near endemic	Endemic	High	x	x						x	x	x		
Cisticola, Cloud	<i>Cisticola textrix</i>	x	0.00			Near endemic	Near-endemic	High	x	x							x	x		
Coot, Red-knobbed	<i>Fulica cristata</i>	x	14.41					Low			x						x			
Cormorant, Reed	<i>Phalacrocorax africanus</i>	x	13.49					Low			x						x			
Crane, Blue	<i>Anthropoides paradiseus</i>	x	73.41	VU	NT		Endemic	High	x	x	x				x			x	x	x
Duck, African Black	<i>Anas sparsa</i>	x	8.33					Low			x						x			

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Duck, Maccoa	<i>Oxyura maccoa</i>	x	1.59	NT	NT			Low			x						x			
Duck, White-faced	<i>Dendrocygna viduata</i>	x	2.78					Low			x						x			
Duck, Yellow-billed	<i>Anas undulata</i>	x	50.92					Low			x						x			
Eagle, Martial	<i>Polemaetus bellicosus</i>	x	7.14	VU	EN			Medium		x	x	x		x	x			x	x	
Eagle, Verreaux's	<i>Aquila verreauxii</i>	x	18.26	LC	VU			High	x	x		x	x	x						
Eagle-owl, Spotted	<i>Bubo africanus</i>	x	12.43					High		x		x	x		x	x	x	x		
Egret, Cattle	<i>Bubulcus ibis</i>	x	4.63					Low		x		x			x			x		
Egret, Great	<i>Egretta alba</i>	x	0.00					Low			x						x			
Falcon, Lanner	<i>Falco biarmicus</i>	x	2.78	LC	VU			Medium		x	x	x	x	x	x	x	x	x		
Falcon, Peregrine	<i>Falco peregrinus</i>	x	1.59					Low			x	x	x	x			x			
Fish-eagle, African	<i>Haliaeetus vocifer</i>	x	3.18					Low			x	x					x			
Flamingo, Greater	<i>Phoenicopterus ruber</i>	x	3.18	LC	NT			Low			x						x			
Flycatcher, Fiscal	<i>Sigelus silens</i>	x	34.40			Near endemic	Endemic	High	x	x		x				x	x	x		

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Goose, Spur-winged	<i>Plectropterus gambensis</i>	x	34.79					High	x		x			x	x		x			
Goshawk, Southern Pale Chanting	<i>Melierax canorus</i>	x	34.66				Near-endemic	High	x	x	x	x		x		x	x	x		
Grebe, Black-necked	<i>Podiceps nigricollis</i>	x	0.00					Low			x						x			
Grebe, Great Crested	<i>Podiceps cristatus</i>	x	1.59					Low			x						x			
Grebe, Little	<i>Tachybaptus ruficollis</i>	x	9.12					Low			x						x			
Greenshank, Common	<i>Tringa nebularia</i>	x	12.70					Low			x						x			
Hamerkop	<i>Scopus umbretta</i>	x	1.86					Low			x						x			
Harrier, Black	<i>Circus maurus</i>	x	2.78	VU	EN	Near endemic	Endemic	Low		x	x					x	x			
Harrier-Hawk, African	<i>Polyboroides typus</i>	x	1.59					Low		x	x	x	x							
Heron, Black-headed	<i>Ardea melanocephala</i>	x	17.33					Medium		x	x	x		x	x			x		
Heron, Grey	<i>Ardea cinerea</i>	x	23.93					Low			x	x					x			



Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>	x	20.23					Low			x	x			x		x			
Kestrel, Greater	<i>Falco rupicoloides</i>	x	21.30					High	x	x		x		x		x		x		
Kestrel, Lesser	<i>Falco naumanni</i>	x	20.37					Medium		x				x	x			x		
Kestrel, Rock	<i>Falco rupicolus</i>	x	27.41					High	x	x		x	x	x	x	x		x		
Kingfisher, Malachite	<i>Alcedo cristata</i>	x	2.78					Low			x						x			
Kingfisher, Pied	<i>Ceryle rudis</i>	x	2.78					Low			x						x			
Kite, Black-shouldered	<i>Elanus caeruleus</i>	x	15.44					High	x	x		x		x	x					
Korhaan, Blue	<i>Eupodotis caerulescens</i>	x	56.34	NT	LC	Endemic (SA, Lesotho, Swaziland)	Endemic	High	x	x					x			x		x
Korhaan, Karoo	<i>Eupodotis vigorsii</i>	x	13.10	LC	NT		Endemic	High	x	x								x		x
Lapwing, Blacksmith	<i>Vanellus armatus</i>	x	49.33					Low			x				x		x	x		
Lark, Large-billed	<i>Galerida magnirostris</i>	x	75.27			Near endemic	Endemic	High	x	x						x		x		

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Moorhen, Common	<i>Gallinula chloropus</i>	x	17.07					Low			x						x			
Night-Heron, Black-crowned	<i>Nycticorax nycticorax</i>	x	0.00					Low			x						x			
Owl, Barn	<i>Tyto alba</i>	x	7.41					Medium		x		x			x	x	x	x		
Pipit, African Rock	<i>Anthus crenatus</i>	x	11.11	LC	NT	Endemic (SA, Lesotho, Swaziland)	Endemic	Low					x							
Plover, Kittlitz's	<i>Charadrius pecuarius</i>	x	28.70					Low			x						x			
Plover, Three-banded	<i>Charadrius tricollaris</i>	x	57.68					Low			x						x			
Pochard, Southern	<i>Netta erythrophthalma</i>	x	1.59					Low			x						x			
Prinia, Karoo	<i>Prinia maculosa</i>	x	76.19			Near endemic	Endemic	Medium		x							x	x		

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Ruff	<i>Philomachus pugnax</i>	x	3.18					Low			x						x			
Sandpiper, Wood	<i>Tringa glareola</i>	x	3.18					Low			x						x			
Secretarybird	<i>Sagittarius serpentarius</i>	x	19.44	VU	VU			High	x	x								x	x	x
Shelduck, South African	<i>Tadorna cana</i>	x	51.86				Endemic	Medium			x						x			
Shoveler, Cape	<i>Anas smithii</i>	x	7.14				Near-endemic	Low			x						x			
Snake-eagle, Black-chested	<i>Circaetus pectoralis</i>	x	1.86					High	x	x	x	x		x	x			x	x	
Snipe, African	<i>Gallinago nigripennis</i>	x	1.59					Low			x						x			
Sparrowhawk, Black	<i>Accipiter melanoleucus</i>	x	0.00					Low			x	x								
Sparrowhawk, Rufous-chested	<i>Accipiter rufiventris</i>	x	2.78					Low			x	x								
Sparrowlark, Black-eared	<i>Eremopterix australis</i>	x	2.78			Near endemic	Endemic	Low		x	x						x	x	x	

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Spoonbill, African	<i>Platalea alba</i>	x	5.96					Low			x						x			
Starling, Pied	<i>Spreo bicolor</i>	x	94.44	94.44		Endemic (SA, Lesotho, Swaziland)	Endemic	High	x	x	x	x			x	x	x	x		
Stilt, Black-winged	<i>Himantopus himantopus</i>	x	23.01					Low			x						x			
Stint, Little	<i>Calidris minuta</i>	x	9.12					Low			x						x			
Stork, Black	<i>Ciconia nigra</i>	x	0.00	LC	VU			Low			x		x							
Stork, White	<i>Ciconia ciconia</i>	x	0.00					Medium		x	x				x			x	x	
Sunbird, Southern Double-collared	<i>Cinnyris chalybeus</i>	x	5.56			Near endemic	Endemic	Low		x							x	x		
Teal, Cape	<i>Anas capensis</i>	x	8.73					Low			x						x			
Teal, Red-billed	<i>Anas erythrorhyncha</i>	x	13.37					Low			x						x			
Thrush, Karoo	<i>Turdus smithi</i>	x	34.12			Near endemic	Endemic	Low				x								

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Tit, Grey	<i>Parus afer</i>	x	10.19			Near endemic	Endemic	Low		x							x	x	x	
Vulture, Cape	<i>Gyps coprotheres</i>	x	2.78	EN	EN		Near-endemic	Low		x				x						
Weaver, Cape	<i>Ploceus capensis</i>	x	7.14			Near endemic	Endemic	Low				x								
White-eye, Cape	<i>Zosterops virens</i>	x	25.40			Near endemic	Endemic	Low				x								
Woodpecker, Ground	<i>Geocolaptes olivaceus</i>	x	1.86			Endemic (SA, Lesotho, Swaziland)	Endemic	Low					x							

- **Grassy Karoo**

The study area lies at the intersection between Nama Karoo and Grassland biomes (Mucina & Rutherford, 2006), described by Harrison *et al.* (1997) as Grassy Karoo. The dominant vegetation type in the study area is Eastern Upper Karoo, which occurs on the plains where the PV assessment area is located, and is dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). Rainfall occurs mainly in autumn and summer, peaking in March. The mean annual precipitation ranges from about 180mm to 430mm. Incidence of frost is relatively high. Mean maximum and minimum monthly temperatures in Middelburg (Grootfontein) are 36.1°C and -7.2°C for January and July, respectively (Mucina & Rutherford, 2006).



**Figure 25:** Example of Eastern Upper Karoo (Grassy Karoo) occurring on plains where the proposed PV area is located



**Figure 26:** Example of Besemkaree Koppies Shrubland which occurs on slopes

- **Surface Water**

Surface water is of specific importance to avifauna in this semi-arid environment. The study area contains many boreholes with open water troughs that provide drinking water to livestock. Open water troughs are important sources of surface water and could potentially be used extensively by various bird species, including large raptors, to drink and bath. There are also a number of dams and natural water bodies in the study area, which are located in drainage lines (see **Figure 27** below). The dams and water bodies were mostly dry when the surveys were conducted, but it could hold water after good rains, when it could be attractive to various bird species, including large raptors, to drink and bath. It could also serve as an attraction to water birds when it contains water.





**Figure 27:** A dam in study area

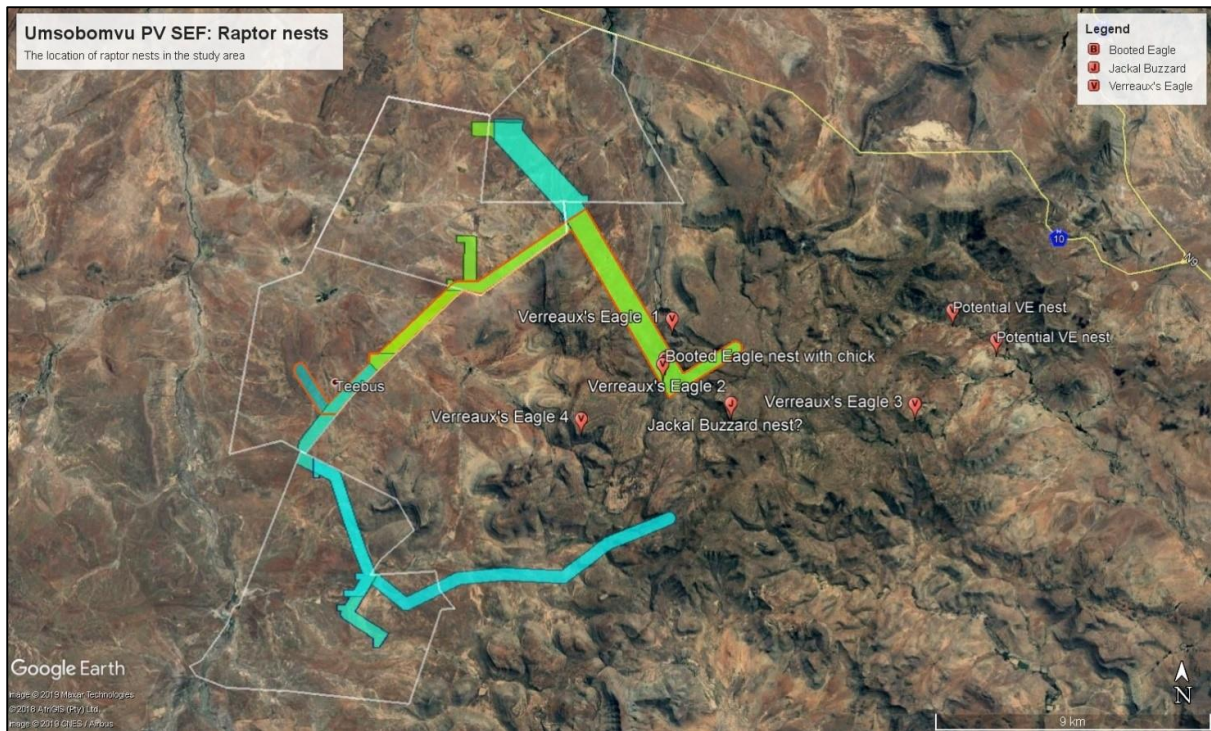
- **Cliffs**

The south-eastern part of the broader area contains several cliffs which is utilised by a number of cliff-nesting raptors for breeding, including Booted Eagle, Verreaux's Eagle (see **Figure 28** below) and possibly Jackal Buzzard. **Figure 29** below shows the location of known nests in the study area.



**Figure 28:** Verreaux's Eagle nest on a cliff in study area





**Figure 29:** Location of raptor nests in study area

- **High Voltage Lines**

High voltage lines are an important roosting and breeding substrate for large raptors in the tree-less Karoo habitat (Jenkins *et al.*, 2006). There are two (2) 400kV transmission lines running through the study area, namely the Hydra-Poseidon 400kV 1 and 2 (see **Figure 30** below). No raptor nests were recorded on the transmission lines.



**Figure 30:** Hydra-Poseidon 400kV 1 high voltage line running through the study area

- **Fences**

The study area is fenced off into grazing camps (see **Figure 31** below). Farm fences provide important perching substrate for a wide range of birds in this treeless environment where natural perches are scarce, as a staging post for territorial displays by small birds and also for perch hunting for raptors such as Greater Kestrel, Rock Kestrel, Black-winged Kite and Southern Pale Chanting Goshawk.





**Figure 31:** The study area contains many fences

- **Agriculture**

The study area contains a number of agricultural clearings and irrigated pivots (see **Figure 32** below). These areas may attract several solar and power line priority species, including Ludwig's Bustard, Blue Crane, Spurwing Goose, Egyptian Goose, Helmeted Guineafowl, White Stork and Blue Korhaan.



**Figure 32:** Irrigated fields in study area

- **Alien Trees**

Large indigenous trees are rare in the Karoo, therefore alien trees of the genus *Pinus*, *Populus* and *Eucalyptus* have been introduced in many areas, often around homesteads, but also at boreholes (see **Figure 33** below). In some places, these alien species have become an invasive threat in drainage lines. Many solar priority species use alien trees for nesting and roosting.





**Figure 33:** Alien trees in study area

#### 6.8.1.3 Avifauna

##### ▪ **Southern African Bird Atlas 2**

The SABAP2 data indicate that a total of 185 bird species could potentially occur in the broader area – Appendix 2 of the Avifaunal Specialist Study Report provides a comprehensive list of all the species, including those recorded during the pre-construction monitoring. Of these, 78 species are classified as priority solar species (see section 4 of Avifaunal Specialist Study Report for the definition of a priority species). The probability of a priority species occurring in the study area is indicated in **Table 16**.

**Table 16** lists all the solar priority species and the possible impact on the respective species by the proposed solar energy infrastructure. The following abbreviations and acronyms are used:

EN = Endangered

VU = Vulnerable

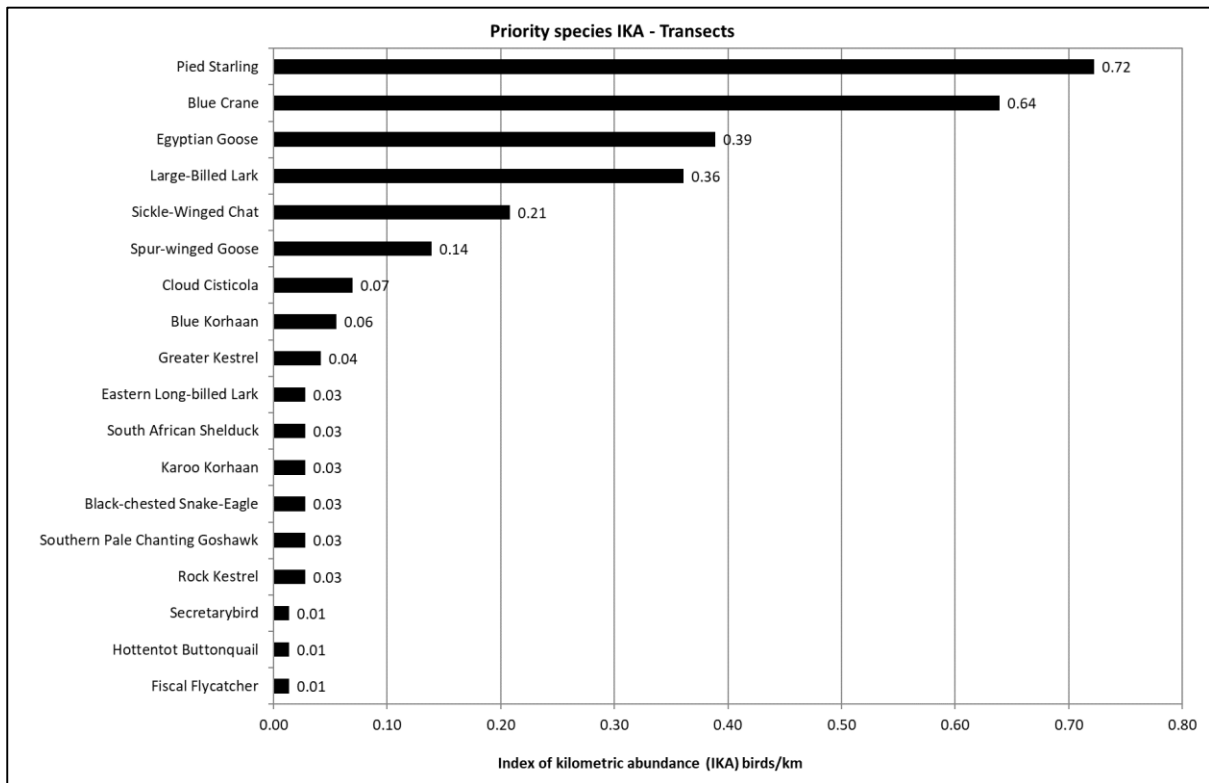
NT = Near-threatened

##### ▪ **Pre-Construction Surveys**

A visit to the study area was conducted on 15 and 16 January 2019, followed up by on-site surveys from 17 - 19 January and May 2019. Surveys were conducted according to the best practice guidelines for avifaunal impact studies at solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins et al., 2017). Please see Appendix 1 of the Avifaunal Specialist Study Report (**Appendix 6B**) for the methodology used in the surveys.

- **Priority Species Abundance**

The abundance of solar priority species (birds/km) recorded during the first of two (2) seasonal surveys are displayed in **Figure 34** below.



**Figure 34:** Abundance of solar priority species recorded during first round of surveys

- **Discussion**

The overall abundance of solar priority species at the site was moderate, with an average of 2.83 birds/km being recorded during the two (2) surveys. For all birds combined, the index of kilometric abundance (IKA) for summer was 15.85 birds/km, which is quite high. This indicates that the impact of human activities on the natural habitat has been limited.

## 6.9 Surface Water

The Surface Water Impact Assessment was conducted by Stephen Burton of SiVEST. The full Surface Water Impact Assessment Report is included in **Appendix 6G**. The Surface Water Impact Assessment has been externally reviewed by a suitably qualified external specialist (refer to **Table 3** in **section 1.4** of this report for details of specialist who undertook external review). The study commenced as a desktop assessment, followed by a site visit which was undertaken from the 5<sup>th</sup> to the 7<sup>th</sup> of February 2019.

The environmental baseline from a surface water perspective is presented below.

### 6.9.1 Desktop Findings

In terms of the Environmental Potential Atlas (ENPAT) (2002) national database, from a catchment perspective, the study site is located within the Orange Primary Catchment. More specifically, the study area is situated within the quaternary catchments D32C and D32B. The study site falls within the newly defined Water Management Areas (WMAs) of South Africa, as stated in Government Notice No. 1056 (16<sup>th</sup> of September 2016), within the Upper Orange WMA.

Three (3) rivers are shown within the study area according to the National Freshwater Ecosystem Priority Areas (NFEPA) (2011) database, while a number of small wetlands are shown to occur at points associated with farm dams. The closest main river, the Klein-Seekoei River, as contained in the NFEPA (2011) database, is approximately 1 500m west of the Wonderheuwel PV study site. The site drains towards the Klein-Seekoei River to the West of the site. The topography of the site indicates the potential presence of watercourses running east to west, and north to south, across the site. Two (2) perennial rivers are present on the site. Both perennial rivers are tributaries of the Klein-Seekoei River, and both have a class C rating, meaning they are moderately modified. No other conservation sensitive areas were identified on the study site.

### 6.9.2 In-Field Findings and Delineations

The in-field wetland delineation assessment took place between the 5<sup>th</sup> and 7<sup>th</sup> of February 2019. Conditions were hot and sunny with partial cloud cover. The study site has historically been used for grazing by sheep, and most of the palatable plants have been selectively grazed out, with many of the remaining plants being poisonous for livestock. It was noted that the first decent rain (50mm) in a number of years had fallen just prior to the site visit, and as such, a number of inundated areas were present that would normally be dry.

The fieldwork ground-truthing, verification and delineation assessment was undertaken to scrutinise the results of the desktop assessment, as well as to identify any potentially overlooked wetlands and/or riparian habitat in the field within the study site.

The fieldwork investigation confirmed that there are a number of non-perennial drainage channels which can be found flowing through the study site in an east to west direction, and south to north direction. In addition, a number of tributaries of the Klein-Seekoei River flows from within the site to the actual Klein-Seekoei River, which runs adjacent to the western boundary of the study area.

Aside from the non-perennial watercourses, a number of man-made farm dams are present on the property, but many of these appear to have been dry for an extended period.

Overall from the above, the following water resources were identified in the field on the study site:

- A number of non-perennial watercourses without associated Riparian Habitat.
- A number of perennial watercourses with associated Riparian Habitat.

The biophysical characteristics and indicators of the above-mentioned water resources are provided in the Sub-sections below.

#### 6.9.2.1 *Non-Perennial Watercourses without Riparian Habitat*

##### ▪ **Topography Associated with a Watercourse**

The watercourses are shaped by a poorly to moderately developed channel which varies along the length of the watercourses within the study site. Some parts of the channel are better defined than other areas where the channel becomes more diffuse. For example, some of the mid-sections of the watercourse are well defined, whereas the lower reaches of the watercourses are much more diffuse. Overall, a macro-channel is present with a smaller defined active (when in flow) channel (**Figure 35**). The width of the macro-channel therefore varies. The macro-channel can be as little as 15m at the narrowest areas and up to 250m at the widest point on the study site.



**Figure 35:** Photo of typical channel structure. The Broad macro-channel section of watercourses is evident, but may have a number of smaller channels and flow paths within macro-channel

In terms of flow, as previously mentioned, the watercourses are non-perennial and flow from an east to west direction, or a south to north direction. The watercourse can be classified as an A-Section watercourse. The watercourse is above the zone of saturation, although relatively minimal soil depth (ranging from approximately 50mm to 600mm) along some sections of the active channel means that during the wet season, stormwater run-off / overland flow can be expected for a relatively brief period (hours to days). This is especially true where bedrock can be found extruding from the watercourses in the channel, as well as in eroded areas.



- **Alluvial Soils and Deposited Materials**

Deposited alluvial soils were clearly evident within the active channel as well as within the greater macro-channel bank (**Figure 36**). Sediments were sandy in texture ranging from fine to sandy sized grains. Detrital deposits were also observed in the form of leaves and small twigs.

Soil samples were taken where possible to determine whether soil wetness or wetland soil forms could be identified. Most areas were subject to soil augur restrictions due to the presence of exposed and/or deposited bedrock. Soils that have been deposited via wind or run-off from the surrounding area have however provided some substrate for which vegetation has established.

Soil samples that were taken showed no signs of mottling (which are typically associated with wetlands). The soils did not indicate hydromorphism which typically takes place in wetlands indicating that soil conditions are not favourable to wetland conditions.



**Figure 36:** Alluvial sand deposits within active channel of watercourses

- **Vegetation**

There are no riparian vegetation zones along any of the watercourses across the site (**Figure 37**). Of the vegetation species identified, none can be described as specifically hydrophytic. Presumably, this is a consequence of the semi-arid climate and other environmental constraints (including soil type and depth) limiting the study site.



**Figure 37:** Typical non-riparian vegetation associated with the watercourses at the site

#### 6.9.2.2 *Perennial Watercourses with Riparian Habitat*

- **Topography Associated with a Watercourse**

The perennial watercourses are shaped by a well-developed channel which varies along the length of the watercourses within the study site. Most parts of the channel are well defined, with only a few areas where the channel becomes more diffuse (**Figure 38**).





**Figure 38:** A perennial watercourse observed on site with a well-defined channel

- **Vegetation**

There is a distinct riparian vegetation zone along the perennial watercourses on-site (**Figure 39**). Of the vegetation species identified, many can be described as specifically hydrophytic.



**Figure 39:** Perennial Watercourses have distinct riparian vegetation

### 6.9.3 *Ecological Condition*

#### 6.9.3.1 *Non-Perennial Watercourses without Riparian Habitat*

Since no riparian or wetland habitat is present along the watercourses over most of the site, it is difficult to apply a quantitative assessment of the present ecological state of the systems. As such, the assessment is qualitative in nature, and appropriate reference conditions have been estimated from the level of disturbance that was obvious on the site.

#### ▪ **Present Ecological Condition**

The results of the Present Ecological State assessment for the watercourses are as follows:

- Watercourse Ecological Condition – C Moderately Modified.

From the above, existing impacts are moderately affecting the current state of the watercourses. The factors affecting the various systems are explained below.

The area is semi-arid to arid, and the vegetation on-site should be dominated by a range of drought-tolerant succulent species, with a limited graminoid component. Minimal encroachment of alien species was noted. Overgrazing impacts were extremely apparent along with associated onset of erosion due to animal movement and vegetation removal. Overall, cover was not high, and the habitat could be described as open scrubland.

Overall the impacts identified to be affecting vegetation cover, abundance and composition include overgrazing due to sheep, erosion due to sheep trampling and the excavation of the dams. Water quantity impacts are mainly indirect because of run-off impacts due to infrastructure (dirt roads, tar roads, rail etc.) and decreased vegetation cover due to overgrazing. Water quality impacts affecting the watercourse mainly relate to sedimentation originating from run-off from the surrounding areas and roads. In general, however, the sedimentation impacts are a relatively moderate factor affecting water quality (and geomorphology) which in turn contributes to the current perceived change in state.

#### 6.9.3.2 Perennial Watercourse with Riparian Habitat

In order to apply the Vegetation Response Assessment Index (VEGRAI), it is essential to qualify the reference conditions (Kleynhans *et al.*, 2007). The reference conditions are essentially a determination of the state of the riparian habitat that is completely natural and unmodified / affected by existing impacts. When assessing the state of the riparian habitat, the habitat can be broken down into two (2) components including, the marginal zone and non-marginal zone. The marginal zone includes the area from the water level at low flow, if present, to those features that are hydrologically activated for the greater part of the year (Kleynhans *et al.*, 2007). The non-marginal zone collectively includes the lower and upper zone. The lower zone extends from the marginal zone and ends where a marked increase occurs in lateral elevation, whilst the upper zone extends from the end of the lower zone to the end of the riparian corridor which is usually characterised by steeper slopes and the presence of both riparian and terrestrial vegetation species (Kleynhans *et al.*, 2007).

##### ▪ **Present Ecological Condition**

The results of the VEGRAI assessment for the Klein-Seekoei River, its tributaries and riparian habitat are as follows:

- Klein-Seekoei River, and tributaries, Riparian Habitat Ecological Condition – C Moderately Modified (67.5% of the reference condition).

From the above, existing impacts are moderately affecting the current state of the riparian habitats on site. The factors affecting the various systems are explained below.

Currently the marginal zone appears to be in a graminoid dominated state. Few tree species were present in this zone. This contrasts with what the reference state would be. The reference state should ideally be tree dominated. Nonetheless, the graminoid cover was estimated at approximately 50%, whilst few sub-adult tree species were also observed making up approximately 30% of the vegetation cover. The remaining area directly in the channel was bare owing to scouring effect from flows. Extensive overgrazing, and recent frosts affected the percentage of cover observed during the assessment. Otherwise, minimal encroachment of alien species was noted. Overgrazing impacts were also apparent along with the associated onset of erosion due to animal movement and vegetation removal. Overall, cover was not high, and the habitat could be described as open grassland to open woodland.

The non-marginal zone generally contains a mixture of tree, shrub and graminoid species. The overall state of the non-marginal zone appears to be in transition to a graminoid dominated state. Like the marginal zone, the reference state should be tree dominated. As such, the degree of vegetation cover



is somewhat reduced with less vegetation cover from tree species. Removal for firewood is also likely to contribute to decreased tree occurrence. Finally, overgrazing by cattle is similarly affecting general vegetation cover. It is estimated that tree cover percentage is approximately 30%, whilst herbaceous cover is approximately 20% and graminoid cover is approximately 45%. The remaining is bare soils. Abundance of vegetation in the general non-marginal zone was higher in species diversity, compared to adjacent areas. The moderately higher abundance owes mostly to the increased occurrence of tree and shrub species. Despite the increased tree and shrub occurrence, the current state differs from what should be a tree dominated state.

Overall the impacts identified to be affecting vegetation cover, abundance and composition include overgrazing due to sheep and cattle, removal of vegetation of firewood, and erosion due to animal trampling. Water quantity impacts are mainly indirect because of run-off impacts due to infrastructure (dirt roads) and decreased vegetation cover due to overgrazing. Water quality impacts affecting the watercourse mainly relate to sedimentation originating from run-off from the surrounding areas and roads. In general, however, the sedimentation impacts are a relatively moderate factor affecting water quality (and geomorphology) which in turn contributes to the current perceived change in state from a tree dominated reference state to a graminoid dominated current state.

#### 6.9.4 Ecological Importance and Sensitivity Categorisation

The environmental importance and sensitivity of the watercourses was assessed. A detailed description and reasons for the scoring of the Ecological Importance and Sensitivity Categorisation (EISC) results are displayed in **Table 17** below.

Considering conditions on-site, a fair amount of disturbance has affected the study site. Despite this disturbance, avifaunal species of conservation concern (Blue Cranes) were observed within the watercourses and riparian zones. The disturbance caused by sheep grazing may influence the potential occurrence of sensitive species. Nonetheless, this does not preclude the occurrence of protected species that were noted on site, and other species of conservation significance may occur during other times of the year as seasonal fluctuations may also have a bearing on the potential occurrence.

**Table 17:** Environmental Importance and Sensitivity Category for biotic and habitat determinants associated with identified watercourses and riparian zones

Determinant	Score	Confidence	Reason
<i>Primary Determinants</i>			
1. Rare & Endangered Species	3	2	No specific red data flora species of conservation importance associated with the watercourses were noted during the field assessment. There is a possibility that red data species may grow in the study area at different times of the year and were simply not noticed however during the field assessment.

Determinant	Score	Confidence	Reason
2. Populations of Unique Species	3	2	No populations of unique species were observed during the site visit. However, Blue Cranes were noted feeding within the study site. This elevates the importance and sensitivity of the watercourses.
3. Species/taxon Richness	2	2	Species and taxon richness were moderate in terms of vegetation species. Disturbance due to sheep grazing is an important factor deterring the possible occurrence of indigenous faunal species.
4. Diversity of Habitat Types or Features	2	3	The diversity of habitat types is relatively homogenous.
5. Migration route/breeding and feeding site for water-dependent species	3	3	The watercourses have small crossing points for access, which should therefore not act as barriers for species using the watercourses as migration route / breeding and feeding sites. In addition, the watercourses potentially act as a link between river systems.
6. Sensitivity to Changes in the Natural Hydrological Regime	2	3	The watercourses are highly sensitive to changes in the natural hydrological regime as little or no vegetation is present within the watercourses and they are sand based, thus leading to increased risk of erosion.
7. Sensitivity to Water Quality Changes	2	3	The watercourses are moderately sensitive to water quality changes, this is evident due to current sedimentation impacts within the affected watercourse.
8. Flood Storage, Energy Dissipation & Particulate/Element Removal	2	3	One (1) of the main potential watercourse ecosystem services / functions provided is the ability to provide flood attenuation. The watercourses are therefore regarded as relatively significant in terms of the role it performs in the greater landscape.
<i>Modifying Determinants</i>			
9. Protected Status	3	4	Portions of the study site are classified as CBA areas required for conservation.
10. Ecological Integrity	2	4	The overall EC of the watercourses are classified as C - Moderately Modified.
<b>TOTAL</b>	24	29	
<b>MEDIAN</b>	2,4	2,9	

Determinant	Score	Confidence	Reason
<b>OVERALL ECOLOGICAL SENSITIVITY AND IMPORTANCE</b>	<b>B</b>		

Given the presence of Blue Cranes within numerous watercourses, and the riparian zones, the importance and sensitivity of the watercourse habitat is elevated.

Whilst the condition of the vegetation surrounding the watercourses identified on the study site is somewhat disturbed, the habitat is moderately intact and does not contain any highly sensitive species. The sensitivity is therefore reduced to a limited extent in this regard. However, the potential presence of conservation-worthy species within the watercourses across the site leads to an increase in sensitivity.

Taking the above into account, as well as the EC and ecosystem services results, the EISC for the Watercourses, riparian zones and wetland was categorised as a Class B (High).

#### 6.9.5 Ecological Buffer Zones

An adequate buffer zone is required that is suitable for the type of construction to be undertaken for the proposed development in provision of anticipated impacts. In consideration of this, limited clearance of vegetation will take place in the footprint of the internal roads, operation and maintenance building, lay-down area and under the actual PV panels. Shallow excavations can also be expected for underground cabling and other services that will be required.

Potential impacts to be expected include construction disturbance, habitat edge effects, indirect increased run-off and consequent sedimentation and erosion impacts. These are identified as the main threats to the watercourse drivers (flow, water quality, geomorphology).

From an operation phase perspective, increased surface area characterised by hard impermeable structures (i.e. foundations, road infrastructure etc.) are expected to contribute to increased run-off rates. For the operation phase, a critical factor is the duration of potential impacts that may take place for the lifecycle of the proposed development. A consideration that was accordingly factored into the assessment. Accelerated flow resulting in increased run-off may pose an erosion and sedimentation risk to the watercourses given the shallow soil profile and characteristics of the study site. The increased flow rates are also likely to have flow alteration effects on the watercourses if not managed properly. Therefore, adequate protection of the watercourses will assist in minimising potential impacts downstream. With the implementation of mitigation measures, the identified potential impacts can be minimised.

It must be noted that the buffer zone has been determined bearing in mind that a number of mitigation measures have been proposed in **Table 27** in **section 7** to reduce the potential impact to the delineated watercourses. The buffer zones that were determined include the following:



- All watercourses, rivers Aquatic Buffer
  - Construction Phase Buffer: 15m; and
  - Operation Phase Buffer: 15m.

#### 6.9.6 Risk Assessment

A risk assessment was undertaken as per Government Notice 509 of 2016 (No. 40229) needs to consider the '*regulated area of a watercourse*'. The outer edge of the delineated riparian habitat in addition to the 1:100-year flood line delineation (whichever is greatest) have therefore been taken as the full '*extent of the watercourses*'.

Importantly, the regulated area of the watercourse has been regarded as an exclusion zone for the PV foundations, building components of the plant (operation and maintenance buildings etc.) and underground cabling infrastructure given the sensitivity of the features. The only component that will be within the extent of the watercourse will be the proposed access roads that will make use of existing crossing points to minimise potential increased disturbance.

Given the above, as it is assumed that the proposed development will not directly encroach on the extent of the watercourse, the completion of the risk assessment protocol matrix in terms of Government Notice 509 of 2016 (No. 40229) has been undertaken to show the low risk values and to ascertain the applicability of a general authorisation process, if required.

The detailed results of the risk protocol assessment are provided in Appendix D of the Surface Water Impact Assessment Report (**Appendix 6G**).

Overall, the findings show that the risk of potential impacts on the watercourse was assessed to be in the LOW-risk class. Where risks were identified, a number of control measures have been stipulated which will assist in maintaining this low level of risk. In accordance with the implementation of control measures, all potential risks are classed as LOW. Importantly, only minor impacts will take place on the identified watercourses, and within the surrounding catchment. Therefore, registration for General Authorisation (GA) can be undertaken, where required and agreed with the Department of Water and Sanitation (DWS).

#### 6.10 Agricultural and Soil

The Agricultural and Soils Impact Assessment was conducted by Johann Lanz. The full Agricultural and Soils Impact Assessment Report is included in **Appendix 6A**. It should be noted that a field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and potential agricultural data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development (refer to section 4.1 of Agricultural and Soils Impact Assessment Report for further explanation).

The environmental baseline from an agricultural and soils perspective is presented below.

### 6.10.1 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The proposed development is located on predominantly two (2) similar land types, namely Da6 and Da77. Soils on these land types are fairly similar and are predominantly shallow, loamy sands on underlying rock or less commonly clay. Dominant soil forms are Swartland, Hutton, Mispah, and Valsrivier. The soils would fall into the Duplex and Lithic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land types is provided in Table A1 in Appendix 1 of the Agricultural and Soils Impact Assessment Report.

### 6.10.2 Agricultural capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 the Department of Agriculture, Forestry and Fisheries (DAFF) released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for the production of cultivated crops. Detail of this land capability scale is shown in **Table 18** below.

The project area is classified with land capability evaluation values that range from 1 to 7, with 6 being the predominant land capability. The land capability is limited by the very low climatic moisture availability, the rugged terrain, and the shallow, rocky soils.

**Table 18:** Details of the 2017 Land Capability classification for South Africa

Land capability evaluation value	Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	

Land capability evaluation value	Description
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High
15	

Due to the land capability constraints, agricultural land-use is restricted to grazing only. The natural grazing capacity is given on Cape Farm Mapper as reasonable, at 16 to 17 hectares per large stock unit.

#### 6.10.3 Land-use and development on and surrounding the site

The area is a sheep farming area. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. There are several farmsteads (that is a residential and administrative node of buildings and infrastructure from which a farm is managed) within the study area. There is often agricultural infrastructure, including some irrigation in the proximity of the farmsteads. The only agricultural infrastructure away from the small patches of cultivation, are wind pumps, stock watering points and fencing surrounding grazing camps.

#### 6.10.4 Possible land-use options for the site

The low climatic moisture availability means that natural grazing is the only viable agricultural land-use for most of the area, except for the small patches of irrigation.

#### 6.10.5 Agricultural sensitivity

Agricultural sensitivity is directly related to the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity

of land that is only suitable as grazing land in the country and such land is therefore not considered to have high agricultural sensitivity.

Agricultural sensitivity of a particular development is also a function of the severity of the impact which that type of development poses to agriculture. In the case of PV, fairly large areas of land are excluded from agricultural use, so in terms of that aspect, there is sensitivity.

The majority of the study area has low agricultural potential and therefore low agricultural sensitivity to development and consequent loss of agricultural land use. The only exception are the small patches of irrigation. These have a higher sensitivity, because of their agricultural value, and should be considered 'no-go' areas for any footprint of development that will exclude cultivation. 'No-go' areas require no buffers.

Apart from the cultivated 'no-go' areas, agricultural potential and conditions are very uniform across the rest of the study area and the choice of placement of facility infrastructure therefore has minimal influence on the significance of agricultural impacts.

## **6.11 Geotechnical**

The Geotechnical Impact Assessment was conducted by Cecilia Canahai of JG Afrika (Pty) Ltd. The full Geotechnical Impact Assessment Report is included in **Appendix 6C**. The Geotechnical Impact Assessment was undertaken via a high-level desktop study.

The geotechnical characteristics present over the area in which the site is situated are presented below.

### *6.11.1 Geotechnical Characteristics and Potential Constraints*

From the 1:250 000 Geology map, the following near surface conditions may be encountered on site:

#### *6.11.1.1 Beaufort Group*

The Beaufort Group, which forms part of the Karoo Supergroup, is represented by the Adelaide Subgroup across the site. The Adelaide Formation is comprised of mudstone with subordinate sandstone. The geotechnical characteristics of these rock types are discussed below.

- **Sandstone**

The sandstones of the Karoo Supergroup are closely intercalated with mudrock. The sandstones usually poorly sorted (often containing rock fragments) and have a matrix comprised of clay or iron oxide, and occasionally calcite.

Due to the local climatic conditions, mechanical disintegration is the predominant form of weathering. This typically results in the formation of a relatively thin residual soil mantle overlying the bedrock.

Brink (1983) highlights this variability in the Beaufort Group, where similarly aged thick quartz-rich (more resistant to weathering) sandstones are found adjacent to thin, poorly sorted sandstone.

Karoo Sandstone is also noted to have a non-uniform weathering pattern. Dense competent layers are sometimes underlain by less competent layers of lower consistency, therefore, founding conditions in feldspathic sandstones may not always improve with depth (Brink, 1983).

Slope instability may also be encountered in the Karoo sandstones. Brink (1983) notes four (4) main instability types, namely Disintegration of intercalated mudrock, Pore water pressures on intercalated siltstone, Erosion of underlying strata and Block and wedge failures. Slope instability will be assessed during the detailed site investigation; however, weathering and erosion of the intercalated mudstone and block / wedge failures are anticipated to be the primary instability types.

- **Mudrock**

The mudrocks of the Karoo Supergroup are known to break down upon exposure. The mechanisms of breakdown are still unclear, however, changes in temperature, humidity, moisture content and stress relief are believed to be possible causes. Three (3) main responses to the breakdown are highlighted by Brink (1983), namely very little break down of the rock, disintegration of the rock into pieces of various sizes and shapes and lastly, slaking into silt and clay-sized particles.

Brink (1983) also noted moisture content related volumetric changes in the Karoo mudrock. Fresh mudrock samples from the Beaufort group were observed to swell upon exposure to water. This property should be considered when founding any structures in or in close proximity to flood plains.

Slope instability may also be encountered in the Karoo mudrock. Brink (1983) highlight two (2) main types of instability, namely the movement of completely weathered / colluvial material and the sliding of rock on bedding planes. Although these instability events were predominantly noted in KwaZulu-Natal, care should be taken when working with cuttings and long / deep excavations. As mentioned above, mudrock is closely intercalated with sandstone. Undercutting of more weathering resistant sandstone may also occur, which could cause slope instability.

Due to the dry climate, a deep weathering profile / thick residual soils are not expected on site. Residual mudrock soils are also known to be potentially expansive and laboratory tests will need to be undertaken to confirm this.

- **Dolerite**

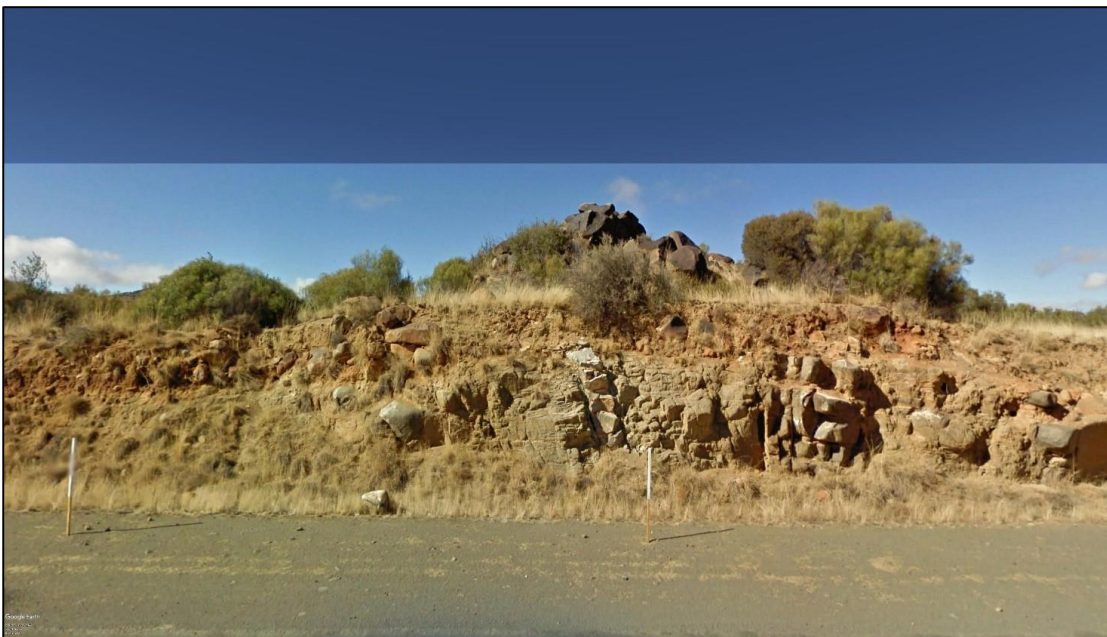
The Karoo Supergroup contains many Jurassic aged dolerite intrusions. The magma predominantly intruded into the weaker argillaceous horizons in the form of sills and occasionally dykes (Brink, 1983).

Fresh / solid dolerite typically forms boulder/fractured dolerite during the initial stages of weathering. Due to mechanical breakdown being the predominant form of weathering in this region, further weathering results in the formation of gravel and/or granular dolerite with sandy soils (Brink, 1983).

Founding conditions on residual dolerite are generally non-problematic in areas with a dry climate. Care should be taken in areas with calcrete, as calcrete powder has been noted to increase the Plasticity Index of the residual dolerite (Brink, 1983).

Dolerite boulders will cause difficult excavation conditions due to their size and scattered occurrences. Hard excavation conditions are also expected in areas with shallow bedrock. Additional site clearing may be required to remove boulders from potential development sites. Potentially unstable talus deposits formed from dolerite corestones may be encountered on slopes.

Weathered dolerite may be targeted for use during construction of internal roads etc. The identification of potential borrow pits and the usage of the dolerite for construction material will need to be confirmed during a more comprehensive site investigation with laboratory testing.



**Figure 40:** Dolerite weathering profile with corestones and surface boulders (N10 – Google Earth)



**Figure 41:** Dolerite profile with boulders on surface (N10 – Google Earth)



**Figure 42:** Dolerite ridge with boulders on surface (N10 – Google Earth)

- **Quaternary Deposits**

- Alluvium / Colluvium / Talus**

- Alluvial deposits are created when sediments are transported and deposited by water. Alluvial deposits may be quite thick, variable in composition and be prone to settlement.

Colluvial deposits are created when sediments are transported and deposited by gravity. As mentioned above, talus deposits are a type of colluvial deposits that accumulate on talus element of slopes. Talus deposits generally occur where there are steep slopes below a stronger caprock. The caprock on this site is expected to be dolerite and/or sandstone. Talus deposits accumulate at their natural angle of



repose and the upper part of talus slopes have a factor of safety that is close to 1.0. Due to weathering and colluvial action, talus deposits are generally poorly sorted, with large / coarse particles occurring with a finer matrix. The finer matrix has less strength than the surrounding unweathered rock fragments / debris, therefore the properties of this matrix influence the stability of the slope. With time, deterioration and weathering of the talus deposits result in instability. In addition to potential slope instability, difficult excavation conditions may be expected due to the large unweathered boulders.

## 6.12 Visual

The Visual Assessment (VIA) was conducted by Kerry Schwartz of SiVEST. The full VIA Report is included in **Appendix 6J**. The VIA has been externally reviewed by a suitably qualified external specialist (refer to **Table 3** in **section 1.4** of this report for details of specialist who undertook external review). The VIA has been based on a desktop-level assessment supported by field-based observation undertaken during the scoping phase of the proposed development. Fieldwork undertaken during the scoping phase of the VIA involved a four (4) day site visit was undertaken between the 4<sup>th</sup> and the 7<sup>th</sup> of February 2019 (mid to late summer).

The environmental baseline from a visual perspective and the physical and land-use related characteristics are outlined below as they are important factors contributing to the visual character of the study area. Defining the visual character of an area is an important factor in the assessment of visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured by establishing the degree to which the development would contrast with, or conform to, the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, the economic importance of the scenic quality of the area, inherent cultural value of the area and the presence of visual receptors.

### 6.12.1 Topography

Areas of flat relief, including the flat plains and the higher-lying plateaus, are characterised by wide-ranging vistas (**Figure 43**), although views eastwards will be somewhat constrained by the hilly terrain in the western sector of the study area (**Figure 44**). In the hillier and higher-lying terrain, the vistas will depend on the position of the viewer. Viewers located within some of the more incised valleys for example, would have limited vistas, whereas a much wider vista would be experienced by viewers on higher-lying ridge tops or slopes. Importantly in the context of this study, the same is true of objects placed at different elevations and within different landscape settings. Objects placed on high-elevation slopes or ridge tops would be highly visible, while those placed in valleys or enclosed plateaus would be far less visible.

The PV arrays will not however be located on high elevation slopes or on ridgelines and as such there will be minimal impact on the skyline. However, with little to no topographic shielding, the steel structures of the proposed substations at a maximum height of 25m are likely to be visible from many of the locally occurring receptor locations.



Maps showing the topography and slopes within and in the immediate vicinity of the proposed application site are provided in **Figure 14** and **Figure 15** respectively (**Section 6.3**).



**Figure 43:** View northwards across the study showing area wide-ranging vistas



**Figure 44:** Hilly terrain constraining views east and south-east

#### 6.12.2 *Vegetation*

As discussed in **section 6.7**, vegetation cover across the study area is predominantly short and sparse and thus will not provide any visual screening. In some instances, however, tall exotic trees planted around farmhouses will restrict views from receptor locations (**Figure 45**).



**Figure 45:** Screening vegetation around farmhouses

### 6.12.3 Land Use

Sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. In addition, there are no towns or settlements in the study area and thus, there are very low levels of human transformation and visual degradation across much of the study area.

The short, scrubby or grassy vegetation that occurs over the entire study area offers no visual screening in itself, and thus terrain / topography is the most important factor in limiting vistas. Exceptions to this situation occur at some local farmsteads where trees and shrubs have been established around the farmstead, providing effective screening from the surrounding areas.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

### 6.12.4 Visual Character and Cultural Value

The above physical and land use-related characteristics of the study area contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely

natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as telephone or electrical infrastructure. The visual character of an area largely determines the sense of place relevant to the area. This is the unique quality or character of a place, whether natural, rural or urban which results in a uniqueness, distinctiveness or strong identity.

As mentioned, much of the study area is characterised by natural landscapes with some pastoral elements and low densities of human settlement. Livestock grazing is the dominant land use. These activities have not transformed the natural landscape to any significant degree and as such a large portion of the study area has retained its natural character and is dominated by largely natural views.

There are no towns or built-up areas in the study area influencing the overall visual character and thus there are very low levels of human transformation and visual degradation across much of the study area. Built form is largely dominated by isolated farmsteads, gravel access roads, telephone lines, low voltage power lines, fences and windmills, although the N10 national route and existing high voltage power lines form significant anthropogenic elements in the study area. The presence of this infrastructure is an important factor in this context, as the introduction of a development such as a solar energy facility (SEF) would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The greater area surrounding the development site is an important component when assessing visual character. The area can be considered to be typical of a Karoo or 'platteland' landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa's dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by scattered farmsteads and small towns. Over the last couple of decades an increasing number of tourism routes have been established in the Karoo and in a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway. Examples of this may be found in the '*Getaway Guide to Karoo, Namaqualand and Kalahari*' (Moseley and Naude-Moseley, 2008).

The typical Karoo landscape can be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

Cultural Landscapes can fall into three (3) categories (according to the Committee's Operational Guidelines):

- *'a landscape designed and created intentionally by man'*;
- an *'organically evolved landscape'* which may be a *'relict (or fossil) landscape'* or a *'continuing landscape'*; and
- an *'associative cultural landscape'* which may be valued because of the *'religious, artistic or cultural associations of the natural element'*.

The typical Karoo landscape consisting of wide-open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land-use and economic activity practised in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Noupoot, engulfed by an otherwise rural, almost barren environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In terms of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, 'continuing' landscape.

In light of this, it is important to assess whether the introduction of a solar PV energy facility with associated infrastructure into the study area would be a degrading factor in the context of the natural Karoo character of the landscape. However, considering the fact that a number of SEFs and wind energy facilities (WEFs) have been developed or are likely to be developed across the Karoo, it is possible that renewable energy facilities, including and PV panels, wind turbines may in the future become an integral part of the typical Karoo cultural landscape.

In this instance, visual impacts on the cultural landscape would be reduced by the fact that the area is relatively remote and there are relatively few tourism or nature-based leisure facilities in the study area. In addition, the N10 national route that traverses the study area does not form part of a designated tourism route and is not expected to experience heavy volumes of tourist traffic.

#### 6.12.5 Visual Sensitivity

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer, 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area, SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer, 2005).

Based on the criteria in the matrix (**Table 19**), the visual sensitivity of the area is broken up into a number of categories, as described below:

- i) **High** - The introduction of a new development such as a solar PV facility would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.



- ii) **Moderate** – Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.
- iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

**Table 19:** Environmental factors used to define visual sensitivity of study area

FACTORS	DESCRIPTION	RATING												
		LOW								HIGH				
		1	2	3	4	5	6	7	8	9	10			
Pristine / natural / scenic character of the environment	Study area is largely natural with areas of scenic value and some pastoral elements.													
Presence of sensitive visual receptors	Relatively few sensitive receptors have been identified in the study area.													
Aesthetic sense of place / visual character	Visual character is typical of Karoo Cultural landscape.													
Irreplaceability / uniqueness / scarcity value	Although there are areas of scenic value within the study area, these are not rated as highly unique.													
Cultural or symbolic meaning	Much of the area is typical of a Karoo Cultural landscape.													
Protected / conservation areas in the study area	No protected or conservation areas were identified in the study area.													
Sites of special interest present in the study area	No sites of special interest were identified in the study area.													
Economic dependency on scenic quality	Few tourism / leisure-based facilities in the area													
International / regional / local status of the environment	Study area is typical of Karoo landscapes													
**Scenic quality under threat / at risk of change	Introduction of an SPF will alter the visual character and sense of place. In addition, the development of other renewable energy facilities in the broader area as planned will introduce an increasingly industrial character, giving rise to significant cumulative impacts													

\*\*\*Any rating above '5' for this specific aspect will trigger the need to undertake an assessment of cumulative visual impacts.

Low			Moderate				High		
10	20	30	40	50	60	70	80	90	100

Based on the above factors, the total score for the study area is 42, which according to the scale above, would result in the area being rated as having a low to moderate visual sensitivity. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts and is based on the physical characteristics of the study area, economic activities and land-use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

No formal protected areas were identified in the study area, and only one (1) tourism facility was identified. In addition, relatively few sensitive or potentially sensitive receptors were found to be present.

#### *6.12.6 Visual Absorption Capacity*

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

The relatively flat topography in the study area and the relative lack of vegetation to provide screening would reduce the visual absorption capacity across much of the area. This would be offset to some degree where the landscape has already undergone significant transformation as a result of the N10 National route and the 400kV power lines, thus increasing the overall visual absorption capacity of the landscape.

Visual absorption capacity in the study area is therefore rated as low to moderate.

#### *6.12.7 Visually Sensitive Areas on the Site*

During the scoping phase, all project specialists were requested to indicate environmentally sensitive areas within the application site. This exercise aimed to demarcate those areas of the application site which should be precluded from the solar PV development footprint. From a visual perspective, these would be areas where the establishment of PV panels or other associated infrastructure would result in the greatest probability of visual impacts on potentially sensitive visual receptors.

Using GIS-based visibility analysis, it was possible to determine which sectors of the application site would be visible to the highest numbers of receptors in the study area. This analysis took into account all the sensitive and potentially sensitive receptor locations identified as well as points along the N10 receptor roads at 500m intervals. The areas visible to the highest number of receptors were rated as areas of 'high sensitivity' and PV panels should preferably be precluded from these areas in order to reduce the potential visual impact on the identified sensitive and potentially sensitive receptor locations. However, as the study area as a whole is rated as having a low to moderate visual sensitivity (refer to section 3.3 of the VIA Report), these zones are not considered to be areas of high visual sensitivity or

'no-go' areas, but rather should be viewed as zones where development should be limited, as the PV panels will still be highly visible.

It should be noted that this sensitivity rating applies to PV fields only. The visual impacts resulting from the associated infrastructure are considered to have far less significance when viewed in the context of multiple PV panels and as such the infrastructure has been excluded from the sensitivity analysis.

It should be noted that the visibility analysis is based purely on topographic data available for the broader study area and does not take into account any localised topographic variations or any existing infrastructure and / or vegetation which may constrain views. In addition, the analysis does not take into account differing perceptions of the viewer which largely determine the degree of visual impact being experienced.

The visual sensitivity analysis should therefore be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptors.

In addition to the sensitivity ratings, a 500m exclusion zone has been delineated around the existing residences on the application sites and along the N10 receptor road. It was recommended that PV fields should not be developed within these buffer zones so as to prevent significant adverse impacts of glint and glare on the local residents and on motorists using the N10.

These areas of visual sensitivity as identified above have been taken into account in the preliminary layouts.

#### *6.12.8 Sensitive Visual Receptors*

A sensitive visual receptor location is defined as a location from where receptors would potentially be impacted by a proposed development. Adverse impacts often arise where a new development is seen as an intrusion which alters the visual character of the area and affects the 'sense of place'. The degree of visual impact experienced will however vary from one receptor to another, as it is largely based on the viewer's perception.

A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Less sensitive receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. More sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include tourism facilities, scenic sites and residential dwellings in natural settings.

The identification of sensitive receptors is typically based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;



- the presence of sites or routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the EIA study.

As the visibility of the development would diminish exponentially over distance (refer to section 2.4 of VIA Report), receptor locations which are closer to the Solar PV facility would experience greater adverse visual impacts than those located further away. During the scoping phase of the proposed development, zones of visual impact for the solar PV facility were delineated based on distance bands measured from the outer boundary of the application site. These zones were refined during the EIA phase of the proposed development to reflect distance bands measured from the proposed PV array areas.

The degree of visual impact experienced will however vary from one (1) inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area;
- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape); and
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

#### *6.12.8.1 Receptor Identification*

Preliminary desktop assessment of the study area during the scoping phase of the proposed development identified 34 potentially sensitive visual receptor locations, most of which appear to be existing farmsteads or farmhouses. These dwellings are regarded as potentially sensitive visual receptors as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these locations, although sentiments toward the proposed development are unknown.

This assessment was refined according to the findings of the field visit conducted in February 2019 and eight (8) of the identified locations were removed from the list of potentially sensitive receptors. Some of these eight (8) locations were found to be abandoned dwellings while others were identified as structures not considered to be visual receptors. Due to access limitations during the time of the field investigation, it was not possible to fully investigate all of the identified potentially sensitive visual receptor locations from a visual perspective. Notwithstanding this limitation, these receptor locations were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA, via desktop means where required.

Three (3) of the identified receptor locations were confirmed to be sensitive receptors, as they are linked to leisure or nature-based activities within the study area. These three (3) receptors are all component

facilities of Transkaroo Adventures, a nature-based tourism undertaking providing secluded accommodation facilities, hiking trails and 4x4 routes in the scenic eastern sector of the assessment area.

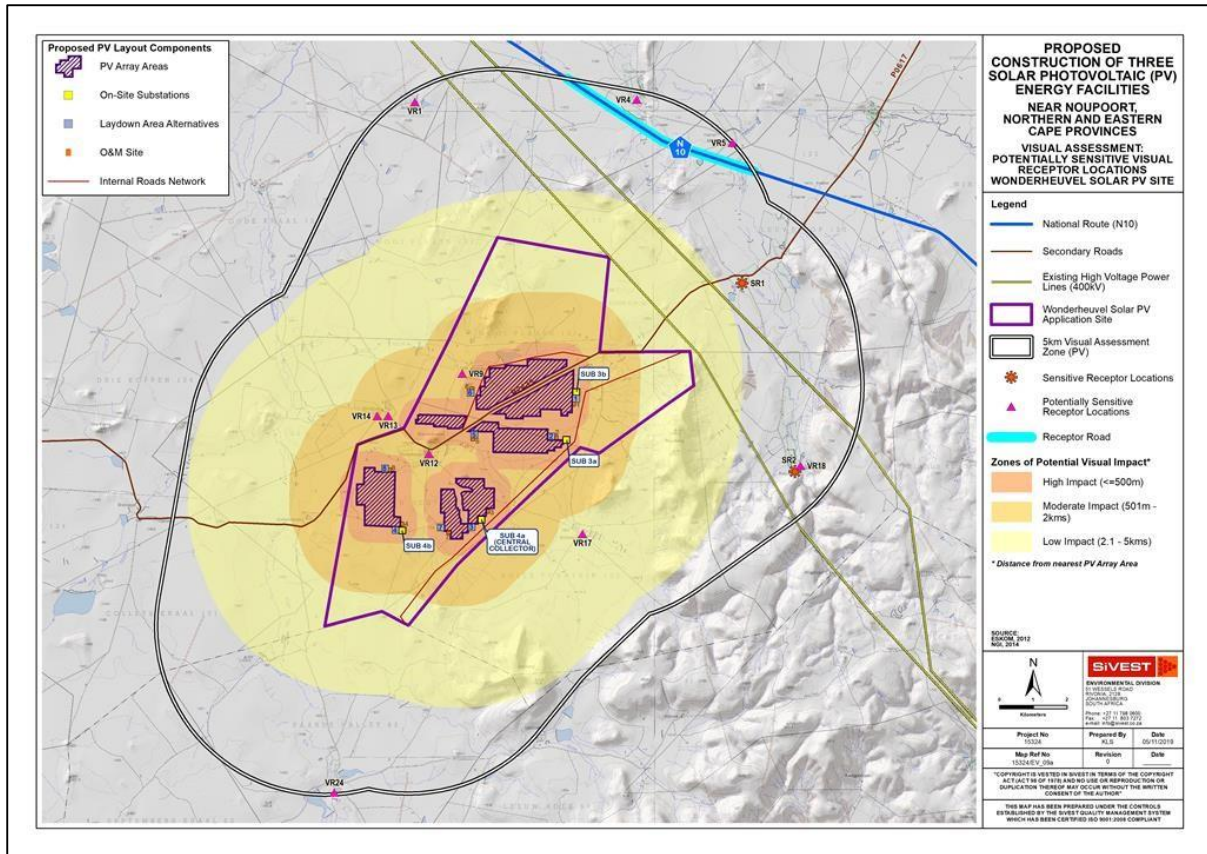
In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfare in the study area is the N10 national route which links Port Elizabeth on the Eastern Cape coast with Upington and the Namibian border to the west. In the local context, the N10 is the primary access route to Hanover and the N1 to the north-west and also to the N9 in the east which links Noupoot and Middelburg.

Thus, although the section of the N10 traversing the study area does not form part of a designated tourism route, it is possible that the road is utilised, to some extent, for its tourism potential and as a result it is considered to be a potentially sensitive receptor road (i.e. a road being used by motorists who may object to the potential visual intrusion of the proposed solar PV facility).

Other thoroughfares in the study area are primarily used as local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

A total of twelve (12) of the potentially sensitive receptors identified in the study area were found to be within 5kms of the Wonderheuvvel PV application site. Only five (5) of these are however located within 5km of a PV array area. Two (2) of the identified receptor locations, namely SR1 and SR2, are considered to be sensitive receptors as they are linked to leisure or nature-based activities within the study area. As these sensitive receptors are both more within 5km from the nearest PV array area however, they are unlikely to experience any visual impacts as a result of the proposed development. The five (5) remaining receptors within 5km of a PV array area are existing farmsteads or farm houses which are regarded as potentially sensitive visual receptors. These receptor locations are indicated in **Figure 46** below.

Sections of the N10 receptor road are within 5kms of the solar PV application site.



**Figure 46:** Potentially sensitive receptor locations within 5kms of Wonderheuveld PV application site

### 6.13 Heritage

The Heritage Impact Assessment (HIA) was conducted by Wouter Fourie of PGS Heritage (Pty) Ltd. The full HIA Report is included in **Appendix 6D**. Due to the prohibitive size of the application area during the scoping phase, it was agreed that fieldwork related to the heritage assessment will only be done in the EIA phase when the footprint areas had been determined and significantly reduced, based on environmental sensitive areas determined by the other specialists.

The HIA thus commenced as a desktop assessment, followed by fieldwork which was subsequently undertaken from the 26<sup>th</sup> – 30<sup>th</sup> of August 2019. A physical survey was conducted on foot and by vehicle through the proposed project area by two (2) qualified archaeologists and two (2) field assistants, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint. The results of the fieldwork have been incorporated into this FEIAR, as well as the updated HIA Report.

The environmental baseline from a heritage perspective is presented below.

### 6.13.1 Previous Studies

Researching the SAHRA Archaeology, Palaeontology and Meteorites (APM) Report Mapping Project records and the SAHRIS online database (<http://www.sahra.org.za/sahris>), it was determined that a number of other archaeological or historical studies have been performed within the wider vicinity of the study area. Previous studies listed for the area in the APM Report Mapping Project included a number of surveys within the area listed in chronological order below:

- Binneman, Booth & Higgitt (2010). A phase 1 Archaeological Impact Assessment (AIA) for the proposed Skietkuil quarries 1 and 2 on the farm Skietkuil no. 3, Victoria West, central Karoo District, Western Cape Province ≈20 kms SW of study area. This study located stone artefacts as well as a lower grind stone, ceramics as well as kraals.
- Booth (2011) A phase 1 archaeological impact assessment (AIA) for the proposed Kleinfontein solar energy facility on the farm Kleinfontein, portion 4 of 167, situated near Noupoot, Northern Cape Province ≈130 kms E from study area. Isolated occurrences of very weathered and patinated Middle Stone Age (MSA) stone artefacts were observed within the proposed area.
- Booth, 2011 (b) A phase 1 Archaeological Impact Assessment (AIA) for the proposed solar facility on the farm Toitdale, portion 1 of 167, situated near Noupoot, Northern Cape Province ≈ 130 kms from the study area. MSA scatters.
- Fourie (2010) Phase 2 Heritage Impact Assessment for the Gamma-Kappa 765kV Transmission line. Various heritage resources were identified including rock engravings 5km south of the Kappa substation.
- Fourie (2016) Basic Assessment for the proposed construction of supporting electrical infrastructure for the Victoria West wind farm, Victoria West, Northern Cape Province ≈Kim form the study area. A MSA scatter was located as well as a colonial structure / farmstead.
- Hart (2015) Heritage Impact Assessment for the proposed Umsinde Emoyeni wind energy facility. ≈40 kms from study area. This study located ESA, MSA and LSA scatters, ceramics, rock paintings and rock engravings pre-colonial kraals and historic buildings and graves.
- Halkett & Webley (2011) Heritage Impact Assessment: proposed Victoria West mini renewable energy facility on the farm Bultfontein 217, northern cape province. ≈30 kms W of the study area. The author found a wide scatter of stone artefactual material including some concentrations, which suggest spatial integrity. Most of the material observed can be ascribed to the Middle Stone Age (MSA).
- Morris (2012) Wildebeest Vlakte Karoo PV solar energy project. Specialist input for the Environmental Impact Assessment for the proposed Wildebeest Vakte Karoo PV solar energy project, Richmond registration division, Northern Cape Province ≈30 kms NW of the study area. Small scatter of MSA artefacts were located as well as two (2) colonial structures of interest, a ruin of a stone dwelling with included ash heap containing porcelain and a small dry stone fortification, part of a blockhouse line developed to defend the railway during the Anglo Boer war.
- Murimbika (2014) Proposed Gamma-Kappa 2nd 765kv Eskom Transmission Powerline and Substations Upgrade Development in Western Cape, Phase 1 heritage impact assessment study. This study runs west of the study area through Victoria West. Findings include ESA, MSA and LSA scatters.
- Van Schalkwyk & Wahl (2007). Heritage Impact Assessment of the Gamma Grassridge Powerlines and substation, Eastern, Western, and Northern Cape Provinces South Africa.

Numerous heritage resources were identified, including buildings and structures; an historical settlement; the landscape of the Camdeboo Karoo and the Springbokvlakte, archaeological sites, graves and traditional building techniques.

### 6.13.2 Findings from the studies

The aim of a desktop study is to create a compendium of the heritage resources in a selected area. These processes provides a good indication of the type of heritage sites to be expected in the area of concern. The area of concern in this case is between Victoria West and Richmond in the upper Karoo area of the Northern Cape, South Africa.

Sources of data include scientific literature on the topic, scientific journals and previous heritage reports that have been conducted in the surrounding area.

People have occupied the Karoo for hundreds of thousands of years (Hart, 2015). This information is borne out by solid scientific studies by researchers both local and international that have worked in the central interior of the country since the early years of the 20th century. Virtually the entire full range of material evidence of human evolution is manifested in the archaeological sites of this area (Hart, 2015).

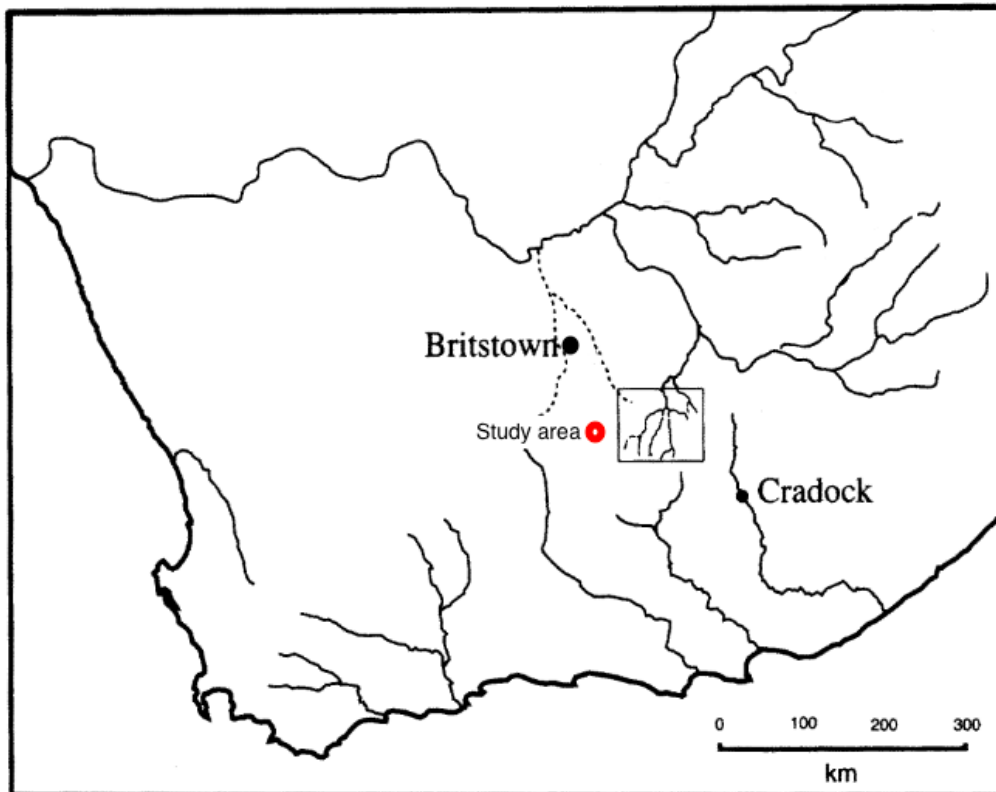
The available data indicates that heritage resources are varied and widely distributed throughout the general vicinity. The heritage features include Stone Age sites, rock art sites, historical buildings associated with villages and farmsteads, cemeteries, and potential cultural landscapes (Prins, 2011).

One (1) of the most complete archaeological research surveys in South Africa was conducted by Professor Garth Sampson over a 30-year period, in the Agter Sneeuberg region (northern side of the Sneeuberg) in the central and upper Seacow River Area that covered an area of 734 square kilometres (km<sup>2</sup>) between Hanover, Richmond and Noupoot in the Northern Cape (Sampson, 1985; Booth, 2011). Sampson (1985) stated that one (1) of the many reasons for him choosing to undertake archaeological research into the Karoo was that it was that the heritage was intact and untouched by ploughing and recent intervention (Hart, 2015). The pre-colonial archaeology of the Karoo was not only visible, but also prolific and in exceptionally good condition.

The valley occurs north-east to south-east of the present study area and has revealed the presence of some 10 000 archaeological sites representing a history of human occupation that dates back at least 250 000 years (Hart, 2015). Since 1980 the headwaters of the Seacow River have been the focus of intensive archaeological survey where more than 16 000 Stone Age sites were recorded during this period (Sampson, 1985) and in-depth ceramic distributional studies were conducted where later Stone Age Lithics and rare Khoekhoe pottery sherds were uncovered during systematic surveys of the area (Sadr & Sampson, 1999)

The Seacow River Valley covers an area of about 2000km<sup>2</sup> and was formerly known to its first trek-boer settlers as the Agter-Sneeuberg (Van der Merwe, 1937). Prior to the arrival of the trek-boers in the 1760's Bushman hunter-foragers who were believed to have been without livestock inhabited the area. Sampson (1989) describes the environment of the upper valley as large, flat, treeless basins on shale bedrock with thin topsoil. Dolerite ridges separate them and hill swarms supporting sparse bushes

together with the typical Karoo scrub that also covers the flats (Sampson, 1989:3). It is believed that the carrying capacity of the area was high and was swarming with game at the time of colonial contact with the Bushman. Key resources for hunter-forager survival, such as springs, firewood, hyrax colonies, plant foods, hornfels for stone tools and rare rock shelters were all concentrated on dolerites.



**Figure 47:** Position of the Seacow River Valley. Adapted from Close & Sampson, 1999

Prins (2011) and Sampson (1985) state that at about 1200 0 1400 AD, a global climatic fluctuation (The Little Ice Age) may well have caused an increase in rainfall in the central Karoo resulting in the area being more suitable than at present for the grazing by cattle and occupation by Khoekhoen pastoralists. It is further stated that archaeology of pastoralist occupation of vast areas in the Karoo are indicated by various stone kraal complexes of which several hundred have been recorded in the Seacow River Valley.

- **Pre-Colonial Past**

- Early Stone Age: 2.5 million to 250 000 years ago

Early Stone Age stone artefacts endure for long periods and generally occur as open-air surface scatters either as isolated occurrences or in large quantities and very rarely in association with other archaeological heritage, plant and material remains (Booth, 2011).

The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two (2) technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulean and comprises more refined and better made stone

artefacts such as the cleaver and bifacial hand axe. The Acheulean dates back to approximately 1.5 million years ago.

The Albany Museum database includes records of occurrences of Acheulean handaxes between Middelburg and the Kamdeboo National Park near Graaff Reinet, as well as a collection of stone artefacts from the Cradock area. Sampson (1985) located a large number of sites within the Seacow River Valley (Booth, 2011).

Victoria West lent its name to the so-called Victoria West Industry, a component of the Early Stone Age period (ESA), of which distinctive prepared cores are the most recognizable element (Inskeep, 1978 in Mitchell, 2002), this is considered a transitional between the ESA and MSA. Binneman *et al* (2010) mentions that during the 1920's, A.H.J. Goodwin (1926, 1946) identified the Victoria West Industry which occurred in the Karoo and along the Vaal River, It is was thought that the Victoria West cores are the 'evolutionary step' before the Levallois or the prepared core industry, indicating an outward spread of this technological change (Lycett, 2009: 175).

- Middle Stone Age: 250 000 to 40 000 years ago

The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique.

The MSA focuses on the emergence of modern humans by the change in technology, behaviour, physical appearance, art, and symbolism (Booth, 2011). Surface scatters of these flake and blade industries occur widespread across southern Africa although rarely with any associated botanical and faunal remains (Booth, 2011). It is also common for these stone artefacts to be found between the surface and approximately 50-80cm below ground. Fossil bone may be associated with Middle Stone Age occurrences. According to Booth (2011), the Albany Museum database holds records of the occurrence of Middle Stone Age stone artefacts around the Cradock area. Sampson has reported many open-air MSA sites which he assigned to the Orangian Industry (dating between 128 000 - 75 000 years old), Florisbad and Zeekoegat Industries dating between 64 000 and 32 000 years old (Booth, 2011).

- Late Stone Age: 40 000 years ago to the historic past

The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths, and is associated with the archaeology of San hunter-gatherers. It is a very important layer on the Karoo landscape as this represents the heritage of the Khoekhoen (historically known as 'Hottentot' by early writers) and San (popularly known as Bushman) people of South Africa (Hart, 2015). The direct descendants of these groups make up a significant proportion of the population today. This heritage is represented by two industries (phases). These are the Interior Wilton which is characterised by a microlithic stone artefact industry characterised by lightly patinated hornfels (indurated shale stone) and the later Smithfield industry characterised by specific classes of stone artefacts and the presence of grass tempered ceramics (Hart, 2015).

The majority of archaeological sites date from the past 10 000 years where San hunter-gatherers inhabited the landscape living in rock shelters and caves as well as on the open landscape, inland and along the coast (Booth, 2011). Booth (2011) mentions that the open sites are difficult to locate because they are in the open veld. The preservation of these sites is poor and it is not always possible to date

them (Deacon & Deacon, 1999; Booth, 2011). Caves and rock shelters, however, in most cases, provide a more substantial preservation record of pre-colonial human occupation (Booth, 2011).

The Later Stone Age archaeology of the Karoo region is described as rich and varied. Various studies (Beaumont & Morris, 1990; Beaumont & Vogel, 1984, and Sampson, 1985) have shown that the general area has been relatively marginal regarding pre-colonial human settlement, but is in fact exceptionally rich in archaeological sites and rock art (Booth, 2011). Bifacial and tanged barbed arrowheads made on very fine-grained dark or black chalcedony are distributed over the Kimberly area in the west, Lesotho in the east and as far south as Britstown and Steynsburg (Humphreys, 1991).

About 2 000 years ago Khoekhoen pastoralists entered into the region and lived mainly in small settlements. They were the first food producers in South Africa and introduced domesticated animals (sheep, goats and cattle) and ceramic vessels to southern Africa (Booth, 2011). Often, these archaeological sites are found close to the banks of large streams and rivers and along the coast. Large piles of freshwater mussel shell (called freshwater middens) usually mark the large stream and river sites and large piles of marine shellfish middens mark the coastal sites.

According to Hart (2015), it was after 1000 years BP people who were herding sheep / goats and possibly cattle, made an incursion into Karoo and established a new economic order based on transhumant pastoralism (Hart, 1989; Sampson et al, 1989; Sampson, 2010). The presence of herding people is represented by stone walled structures that occur throughout the Karoo. They have been recorded within the Zeekoei River Valley, between De Aar and Victoria West and even in the inhospitable high Karoo near Sutherland (Hart, 2005) and on the West Coast (Sadr, 2007).

The spatial distribution of Late Stone Archaeological sites in the Karoo is quite patterned. People needed to be close to water so rivers, pans and springs played an important role in influencing where people lived. As previously mentioned the climate of the Karoo also played a key role. The winters can be extremely cold with temperatures dropping well below zero, made worse by freezing winds (Hart, 2015).

- Ceramics

A study done by Sampson *et al* (1989) discusses to importance of ceramic studies. Eight shallow rock shelters deposits were excavated in the headwaters of the Seacow River. In this case it is explained how depositional sequences can be reconstructed from rare, diagnostic potsherds used as fossil markers. The sherd contexts were examined on a case by case basis, revealing a valley-wide sequence.

Sampson *et al* (1989) discuss the findings; Grass-tempered plain wares first appear in the area at AD 900 together with rare Khoi vessels. The latter disappear from the record for c. 500 years, and then reappear in numbers. Various stamp-decorated wares, forming localized concentrations on the landscape, which suggest social groupings, then replace Khoi ceramics. Following this, these are replaced, apparently abruptly, by a single, valley-wide ubiquitous rocker-stamp wares again rapidly replace motif of double puncture rows, and this. Sampson *et al* (1989) suggest that this final motif appears at the same time as the first European items, therefor suggesting that its arrival must date close to AD 1770. Rocker-stamp motifs continued to be made by the parahistoric Bushmen well into



the post-contact era. This research presents evidence of at least five (5) stylistic upheavals in a single millennium.

Sadr & Sampson (1999) conducted a further study on the ceramics in the Upper Seacow Valley area, they stated that Khoekhoe pottery on surface sites in the upper Seacow River Valley is remarkably like the more abundant, well- stratified Later Stone Age ceramics found some 500-600km away in the south-western Western Cape Province. They believe that pastoralists introduced both. Sadr and Sampson (1999) further state that there appears to have been a steadily expanding herder presence in the upper Seacow Valley with the expansion front moving from north-west to south-east across the study area. Whether this means that some later phases have their origins in the regions between the two (2) areas compared here, remains to be seen.

- Rock Art

Heritage resources such as rock art have been identified by Van Schalkwyk and Wahl (2007) in the Kamdeboo mountains, which occur near Graaff Reinet (≈ 115Km from the study area). Rock engravings are known to exist on dolerite koppies in the region, and occur in hills along the Ongers River (Morris, 2012). Such koppies occur as a major feature in the area (Morris, 2012)

The South African Rock Art Digital Archive (SARADA) database of rock art indicates that rock paintings and engravings occur sporadically within the surrounding area. These include rock art found on four farms near Beaufort West (≈118 kms SW from study area), sixteen localities in the Richmond area (≈35 kms NE from study area), two farms near Murraysburg (≈50 kms S from study area), two farms near Nieu Bethesda (≈100 kms SE from study area) and one near Victoria west (≈40 kms NW from study area)(Van Riet-Lowe, 1941). Some of the most well-known rock engraving site occurs at Nelspoort, at near Beaufort West (Prins, 2011).

- Colonial Archaeology

Hart (2015) states that the indigenous people of Karoo waged a bitter war against colonial expansion as they gradually lost control of their traditional land. Penn (2005) notes the most determined indigenous resistance to trekboer expansion occurred when they entered the harsh environment of the escarpment of the interior plateau (namely Hantam, Roggeveld and Nieuweveld Mountains).

During the first quarter of the nineteenth century the Seacow River valley, between the Sneeuberg range and the Orange River, was on the far north-eastern border of the Cape Colony. Dutch stock farmers (trekboers) were present in small numbers from the 1770s and rapidly filled up the valley between 1800-1820 (Neville *et al.*, 1994).

The frontier history of the Upper Seacow Valley is one (1) on changing interactions between resident Bushman, Hunter-Gatherers and Dutch trekboer pastoralists (Saitowitz & Sampson, 1992). The early direct contact phase spans from 1765-1770 and their direct contact phase is covered by the Bushman / Boer war for the Sneeuberg between 1770-1800. It was believed that the San launched an almost successful campaign to drive the trekboers out. Numerous place names throughout the Karoo such as Oorlogspoort and Oorlogskloof are testimony the skirmishes of the late 18th century (Hart, 2015). The situation became so desperate that the colonists fought back by establishing the 'Kommando' system – the 'hunting' of San was officially sanctioned in 1777 (Dooling, 2007) and in some instances bounties were obtainable from the local landroost (on presentation of body parts). The Drosdy of Graaff Reinet

played a significant role in this long and bitter war, which eventually saw the almost complete destruction of the Karoo San.

The settlement phase covers Earl Macartney's pacification programme of 1800-1825 (Saitowitz & Sampson, 1992; Thompson & Lamar, 1981). There was also an advanced settlement sub-phase during 1826-1850 where surviving pockets of 'wild' Bushmen suffered increasing ecological and social stress. During the Consolidation phase 1850-1890, the upper valley was surrounded by towns and entered the cash economy, with most remaining Bushman becoming servants (Sampson, 1993).

- Glass Beads

Sampson (1993) discusses how surviving documents indicate that among the first European items acquired by the Seacow River Bushmen were glass beads, clay pipes and copper wire. During the pacification programme, Bushmen were encouraged to settle at the farmsteads, flint-and-steel sets, tinderboxes and knives were handed out during this time. Muskets were also given to Bushmen shepherds and farm guards. Other items such as household utensils and European clothing only became common among farm Bushmen in early Consolidation times (Saitowitz & Sampson, 1992). Increased use of building materials like window glass, nails, screws, box strapping and especially fencing wire by the Bushman occurred after 1880.

Saitowitz & Sampson (1992) excavated eight (8) rock shelters in the upper Seacow valley, the superficial deposits contained fragments of nearly all the above-mentioned items among dwindling numbers of indigenous Smithfield artefacts. In six (6) of these excavations, small assemblages of glass beads were found in association with other European items, many of which have can be dated to the nearest quarter century (Saitowitz & Sampson, 1992). Although very small samples, these bead assemblages, together with those from three (3) shelters in the adjacent middle Orange River, offer rare insights into glass bead chronology for the semi-arid interior of South Africa.

Saitowitz & Sampson (1992) state that although all the upper Karoo rock shelters were still in use at the end of the nineteenth century, glass beads were not found reliably associated with any of these dated superficial deposits. Presumably the farm Bushmen responsible for such residues had by this time adopted European dress, and glass beads no longer played any part in the frontier exchange system.

- Guns

Westbury and Sampson (1993) conducted a study, which observed the acquisition of guns by Bushman in the Seacow Valley, the purpose being to provide a timetable of changes in firearm technology throughout the valley. They state that records suggest that Bushman began to use firearms as early as 1770, however material traces only appear from 1825. According to Westbury & Sampson (1993) the earliest that musketry could have been introduced to the upper Seacow Valley would have been the 1770s. During that decade firearms and ammunition were supplied heavily into what was to become the Graaff-Reinet region, and particularly into the Sneeu Berg Mountains immediately to the south of the upper valley. The newly arrived Dutch farmers in the area were believed to be arming themselves and their Khoi servants against marauding Bushman, also mentioned above (Westbury & Sampson, 1993).

The Dutch authorities at the Cape heavily supplemented Trekboer weaponry, as shown by a resolution of the Governor's Council dated 1774, in which an ammunition wagon was ordered to be sent to the Sneeu Berg with "90 firelocks, 900 lbs of gunpowder, 1,800 lbs of lead, 3,000 flints" (Moodie, 1960). In

1977 the situation got more severe between farmers and Bushman, and more ammunition was requested. By 1779 a further request to the Cape authorities, this time for 1000 lbs gunpowder and 2000 lbs lead (Westbury & Sampson, 1993). During these years there were many opportunities for ammunition to be stolen from farmers or acquired by run-away servants.

By 1809 Strife had substantially subsided after the enforcement of Earl Macartney's pacification programme by the Landdrost, and guns had become common throughout the landscape. Farmers and herders were using the weapons at this stage alike, for protection against wild animals.

The introduction of weapons by expanding colonization had an impact on the archaeological record. Westbury & Sampson excavated nine rock shelters in the Upper Seacow valley of which all revealed shallow post-Contact horizons containing a wide variety of European items found among dwindling numbers of artefacts, fauna and indigenous pottery.

- **Findings from the studies**
  - *Palaeontology*

The following is extracted from the Palaeontological Impact Assessment (PIA) completed by Elize Butler of Banzai Environmental (Pty) Ltd for PGS Heritage. The full PIA Report can be viewed in **Appendix 6E**.

*'The proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Tarkastad and Adelaide Subgroups has a Very High Palaeontological Sensitivity, while that of the Quaternary superficial deposits of the Central interior is high and the Karoo dolerite (igneous rocks) is insignificant and rated as zero'.*

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24<sup>th</sup> – 28<sup>th</sup> January 2019. Elsewhere in the Karoo Basin numerous fossils have been uncovered in these geological sediments but only two (2) sites on koppies with fossiliferous outcrops were identified. These fossiliferous sites have been identified as Highly Sensitive and No-go areas. It is recommended that a 50 m buffer will be placed around these areas. In the event that construction is necessary in these sensitive areas it is recommended that the fossils will be collected by a professional palaeontologist. Preceding excavation of any fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

### 6.13.3 Heritage Sensitivities

The evaluation of the possible heritage resource finds, and their heritage significance linked to mitigation requirements was linked to types of landscape. The heritage sensitivity rating does not indicate 'no-go' areas but the possibility of finding heritage significant site that could require mitigation work.

### 6.13.4 Possible Finds

Evaluation of aerial photography has indicated that certain areas may be sensitive from an archaeological perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 20** below.

**Table 20:** Landform to heritage matrix

LAND FORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material



### 6.13.5 Fieldwork Findings

Due to the nature of cultural remains, a systematic controlled-exclusive surface survey was conducted on foot and in a vehicle, over a period of four (4) days by an archaeologist and archaeological technician from PGS. The fieldwork was conducted from the 26<sup>th</sup> - 29<sup>th</sup> of August 2019.



The area is characterised by typical Karoo landscape with low vegetation cover and vast open spaces. The PV facility is situated in the flat low lying areas.



The Wonderheuvél PV and corridor areas revealed tree heritage resource points (**UMS004, UMS005 & 005B, UMS006A, UMS007-010**) within the development footprint (refer to **Table 21** below). As noted in section 1.2 of the HIA Report (**Appendix 6D**), the focus of the fieldwork was on the PV footprints.

**Table 21:** List of heritage finds in the Wonderheuveld PV footprint

i.Site number	ii.Lat	iii.Lon	iv.Description	v.Heritage Significance	vi.Heritage Rating
UMS004	S 31,41905°	E 24,69405°	A small, circular shaped, stone walled enclosure was identified at this location. The enclosure measures approximately 8m x 10m in size and the walls were approximately 1m high and approximately 0.75m wide. It was overgrown and collapsed in several places. The small enclosure was most probably used during the herding of sheep and goats on the farm. Three unknown stone mounds are situated approximately 15m to the south of the stone walled enclosure. The origin or function of these stone mounds is not known as yet. <b>Site extent:</b> 20x20m.	Medium	IIIB
					
<p><b>Stone circle at UMS004</b></p>			<p><b>One (1) of the stone mounds at UMS004</b></p>		
UMS005 &005B	S 31,41926°	E 24,69005°	A low/medium density scatter (5-10 artefacts/10m <sup>2</sup> ) of Late Stone Age artefacts was identified at this location. The scatter is situated on the northern slopes of an elongated rise which overlooks a water course approximately 80m further to the north. The scatter of artefacts follows the slope of the rise all along the water course to the north. It extends for	Low	IIIC



i.Site number	ii.Lat	iii.Lon	iv.Description	v.Heritage Significance	vi.Heritage Rating
			<p>approximately 400m along this water course further to the north and measures approximately 200m wide across the slope of the rise. The artefacts are exposed due to some sheet erosion which occurs across the slope. The artefacts occur in concentrations along this eroded or exposed area. The artefacts consist mostly of debitage (waste material such as flakes, chips and chunks) which were produced from fine-grained and weathered dolerite, quartz and rare CCS (Crypto-crystalline silicates). Some cores and blade fragments were also recognized.</p>		
 <p data-bbox="203 1137 589 1166">View of site UMS005 and 005B</p>			 <p data-bbox="1211 1137 2078 1166">Dolerite core (left), some side and end scrapers collected on the site</p>		
UMS006A	S 31,37868°	E 24,67732°	<p>A small, circular shaped, stone walled enclosure was identified at this location. The enclosure measures approximately 5m x 6m in size and the walls were approximately 1m high and approximately 0.75m wide. It was overgrown and collapsed in several places. The small enclosure was most probably used during the herding of sheep and goats on the farm.</p>	Medium	IIIB

i.Site number	ii.Lat	iii.Lon	iv.Description	v.Heritage Significance	vi.Heritage Rating
			 <p data-bbox="203 1166 517 1198"><b>Stone circle at UMS006A</b></p>		
				 <p data-bbox="1211 1187 1453 1219"><b>Low stone walling</b></p>	



i.Site number	ii.Lat	iii.Lon	iv.Description	v.Heritage Significance	vi.Heritage Rating
UMS008	S 31,35536°	E 24,68892°	<p>Another low density scatter (2-5 artefacts/10m<sup>2</sup>) of Late Stone Age artefacts was identified at this location. The scatter is situated on the northern slopes of a shallow valley or gully which overlooks a water course approximately 40m further to the north. The scatter of artefacts follows the slope of the valley/gully all along the water course to the north. It extends for approximately 100m along this water course further to the north and measures approximately 50m wide across the slope of the valley.</p> <p>The artefacts are exposed due to some sheet erosion which occurs across the slope. The artefacts occur in concentrations along this eroded or exposed area. The artefacts consist mostly of debitage (waste material such as flakes, chips and chunks) which were produced from fine-grained and weathered dolerite, quartz and rare CCS (Crypto-crystalline silicates). Some cores and blade fragments were also recognized.</p>	Low	IIIC





Low density scatter visible in grass



Various blades and side scrapers collected in the area of UMS008



i.Site number	ii.Lat	iii.Lon	iv.Description	v.Heritage Significance	vi.Heritage Rating
UMS009	S 31,35536°	E 24,68892°	<p>Another low density scatter (2-5 artefacts/10m<sup>2</sup>) of Late Stone Age artefacts was identified at this location. The scatter is situated on the slopes of a shallow valley or gully which overlooks a water course approximately 40m further to the south. The scatter of artefacts follows the slope of the valley/gully all along the water course to the south. It also extends across the water course and more artefacts are found on the other side of the water course. The area with artefacts covers approximately 80m x 120m and is situated on both sides of the water course.</p> <p>The artefacts are exposed due to some sheet erosion which occurs across the slopes. The artefacts occur in concentrations along this eroded or exposed area. The artefacts consist mostly of debitage (waste material such as flakes, chips and chunks) which were produced from fine-grained and weathered dolerite, quartz and rare CCS (Crypto-crystalline silicates). Some cores and blade fragments were also recognized.</p>	Low	IIIC
 <p data-bbox="203 1326 465 1353"><b>View of site UMS009</b></p>			 <p data-bbox="1216 1326 1890 1353"><b>Various scrapers and roughout flakes found on slope</b></p>		

i.Site number	ii.Lat	iii.Lon	iv.Description	v.Heritage Significance	vi.Heritage Rating
UMS010A UMS10B	S31.32807° S31.32813°	24.745946° 24.745929°E	Only two (2) sites with fossiliferous outcrops were identified on the proposed development footprint. As the fossiliferous outcrops was located on a koppies it and should not have an effect on the PV solar plants. Thus, although fossiliferous outcrops have been identified no, No-go areas or highly sensitive fossil sites have been identified as the uncovered fossils were poorly preserved and fragmentary.	Low	IIIC



**In situ Lystrosaurus skull**

## 6.14 Palaeontology

As mentioned, the Palaeontological Impact Assessment (PIA) was completed by Elize Butler of Banzai Environmental (Pty) Ltd for PGS Heritage. The full PIA Report can be viewed in **Appendix 6E**. A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24<sup>th</sup> – 28<sup>th</sup> of January 2019 to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed footprint of the development.

The environmental baseline from a palaeontological perspective is presented below.

### 6.14.1 Geological and Palaeontological History

The proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction (McCarthy *et al.*, 2005).

#### 6.14.1.1 Geology

The development area is underlain by a series of Karoo sandstones, mudstones and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000km<sup>2</sup> in South Africa and is the first fully continental sequence in the Karoo Supergroup. The Beaufort Group is divided into the Adelaide subgroup and the overlying Tarkastad subgroup (Johnson *et al.*, 2006).

The Adelaide subgroup rocks were deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments. The Balfour Formation forms the upper part of the Adelaide Subgroup and part of what was called lower to middle Beaufort. The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish-grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium-grained, grey lithofeldspathic sandstones. Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and-fill features. The sandstones are characterised internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are massive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units.

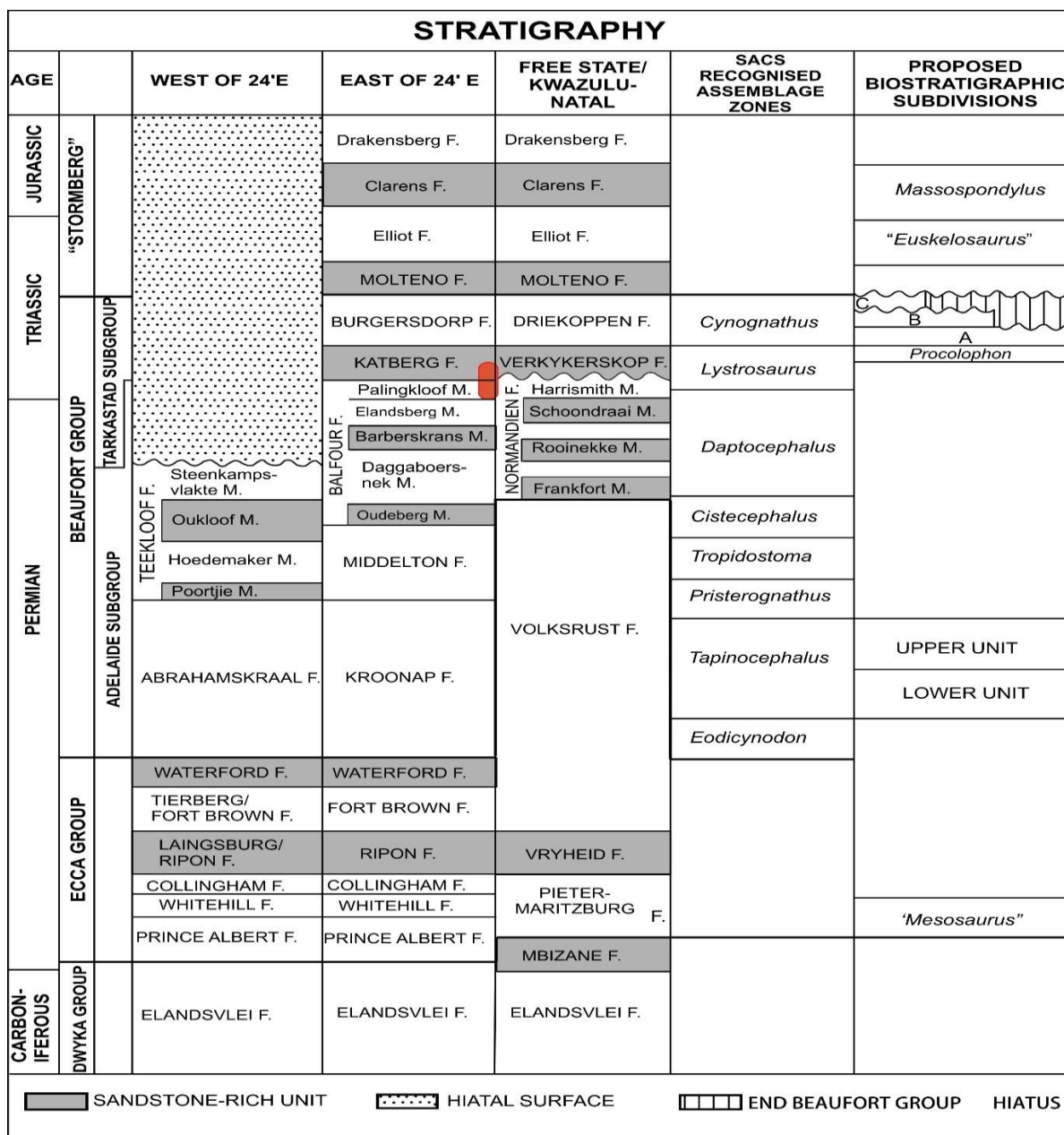
The mudrocks of the Adelaide Subgroup usually has massive and blocky weathering apart from in the Normandien and Daggaboersnek Member. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The arenaceous Katberg Sandstone Formation of the Tarkastad Subgroup comprise of fine to medium-grained pinkish-grey sandstone with subordinate greenish-grey mudstone. The Katberg tabular sheet sandstones are vertically superimposed and divided by erosion surfaces lined with intraformational mud-pebble conglomerates. A maximum thickness of 1000m has been measured (Hiller and Stavrakis, 1984). At the end of the Permian the rivers changed from a meandering river system in the Balfour Formation to a large sand braided fan system in the Katberg Sandstone Formation (Johnson *et al.*, 2006; Smith *et al.*, 2006).

During Jurassic times the subcontinent was inundated with basaltic lava to form the capping basalts of the Jurassic aged Drakensberg Group. During the Jurassic the volcanic Drakensberg were formed and cracks in the earth's crust were filled with molten lava that cooled to form dolerite dykes. Magma injected horizontally between sediments, cooled down and formed horizontal stills of dolerite.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content, namely the *Daptocephalus* Assemblage Zone (Balfour Formation) and the *Lystrosaurus* Assemblage (Katberg Formation) (**Figure 48** below) (Groenewald *et al.*, 1995; Groenewald, 1996).

The Tertiary to Quaternary Cenozoic superficial deposits consist of aeolian sand, alluvium (clay, silt and sand deposited by flowing floodwater in a river valley/ delta producing fertile soil), colluvium (material collecting at the foot of a steep slope), spring tufa/tuff (a porous rock composed of calcium carbonate and formed by precipitation from water, for example, around mineral springs.) and lake deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravels (Partridge *et al.*, 2006).



**Figure 48:** Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions. Beaufort Group of Karoo Supergroup with rock units and fossil assemblage zones relevant to present study marked in red (Modified from Rubidge, 1995). Abbreviations: F. = Formation, M. = Member

### 6.14.1.2 Palaeontology

The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup (Johnson *et al.*, 2006). The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early 'reptiles' to mammals. The diverse *Daptocephalus* Assemblage Zone biotas are of extraordinary interest in that they provide some of the best available information on ecologically-complex terrestrial ecosystems immediately preceding the catastrophic end-Permian mass extinction (Abdala *et al.*, 2006; Mc Carthy *et al.*, 2005; Gastaldo *et al.*, 2005; Retallack *et al.*, 2006).



Sediments of the Beaufort Group are relatively rich in fossils, especially vertebrate fossils. The *Daptocephalus* Assemblage Zone is characterised by the occurrence of the two (2) therapsids namely *Dicynodon* and *Theriognathus*. The *Daptocephalus* Assemblage Zone expands into the lower Palingkloof Member of the Upper Balfour Formation. This Zone is characterised by the occurrence of the two (2) therapsids namely *Dicynodon* and *Theriognathus*. The *Daptocephalus* Zone shows the greatest vertebrate diversity and includes numerous well-preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida as well as captorhinid Reptilia and less well-represented eosuchian Reptilia, Amphibia and Pisces (Kitching, 1977; National Palaeontology Museum databases). Trace fossils of vertebrates and invertebrates as well as *Glossopteris* flora plants have also been described (Bamford, 2004).

The lower Palingkloof Member is of special importance as it precedes the Permo-Triassic Extinction Event which destroyed the vertebrate fauna and extinguished the diverse glossopterid plants (Bamford, 2004).

The lower *Lystrosaurus* Assemblage Zone forms part of the Katberg Formation. Fauna and flora from this assemblage zone is rare as few genera survived the Permo-Triassic Extinction Event. The *Lystrosaurus* Assemblage Zone is characterised by the dicynodont, *Lystrosaurus*, and captorhinid reptile, *Procolophon*. The biarmosuchian and gorgonopsian Therapsida did not survive into the *Lystrosaurus* Assemblage Zone although the therocephalian and cynodont Therapsida are present in moderate quantities. Captorhinid Reptilia are reduced, but this interval is characterised by a unique diversity of oversize amphibians. Fossil fish, millipedes and diverse trace fossils have also been recorded.

Quaternary fossil assemblages are generally rare and low in diversity and is spread out over a wide geographic area. These fossil assemblages may sometimes occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not concentrate their research on Cenozoic superficial deposits although they sometimes comprise of important fossil biotas. Fossil assemblages may comprise of bones, horn cores, fragments of ostrich eggs and mammalian teeth, as well as reptile skeletons. Microfossils, non-marine mollusc shells and freshwater stromatolites are also known from Quaternary deposits. Plant material such as foliage, pollens peats and wood are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps / mounds) and rhizoliths (root casts).

## 6.15 Social

The Social Impact Assessment was conducted by Dr Neville Bews & Associates. The full Social Impact Assessment Report is included in **Appendix 6F**. The Social Impact Assessment was undertaken via desktop means.

The environmental baseline from a social perspective is presented below.

### 6.15.1 Description of the Affected Environment

The Wonderheuvél Solar PV Energy Facility falls within the Northern Cape Province. In the Northern Cape the Pixley ka Seme (DC7) district and Umsobomvu (NC072) local municipalities are affected by the proposed development. The closest towns to the proposed development are Noupoot and Hanover in the Northern Cape, both of which fall within the Karoo Region. The demographics pertaining to these areas, as sourced from Statistics South Africa Census 2011, are described below.

#### 6.15.1.1 Provincial

The Northern Cape Province covers an area of 372 889.36km<sup>2</sup> and, over the same period, had a population of 1 145 861 people giving it a population density of 3.07 people per km<sup>2</sup>. In respect of age structure, the figures pertaining to the Northern Cape are as follows: below 16 years = 30.1%, between 15 and 64 years = 64.2% and above 64 years = 5.7%.

According to the 2018 Mid-year population estimates (Statistics South Africa, 2018a), the Northern Cape Province has the smallest population with an estimated population of 1 225 600 in 2018. As the Mid-year population estimates remain at a provincial level and are not projected to the district and local municipal levels, for comparative purposes, data gathered during Census 2011, will be used where appropriate, notwithstanding it being somewhat outdated.

On this basis, the dominant population group of the Northern Cape, at 50.35%, is black African people. At 53.8% Afrikaans is the dominant home language spoken across the province.

The dependency ratio of the Northern Cape, which indicates the burden placed on the population of working age, between 15 and 64 years, who support children under 15 years and people over 65 years, is 55.7. The sex ratio, which measures the proportion of males to females, in the Northern Cape is 97.3, indicating a higher number of females in the province. The population growth rate for the Northern Cape was -0.40 between 1996 and 2001 and 1.44 between 2001 and 2011.

In 2011, the official unemployment rate in the Northern Cape was 27.4% with the official unemployment rate amongst the youth, aged between 15 and 34 years, being 34.5%. In the 4<sup>th</sup> Quarter of 2018 the official unemployment rate in the Northern Cape had dropped to 25%. These figures must, however, be considered with caution as the official unemployment rate is defined by Stats SA as follows:

*'Unemployed persons are those (aged 15–64 years) who:*

- a) Were not employed in the reference week and;*
- b) Actively looked for work or tried to start a business in the four weeks preceding the survey interview and;*
- c) Were available for work (i.e. would have been able to start work or a business in the reference week) or;*
- d) Had not actively looked for work in the past four weeks but had a job or business to start at a definite date in the future and were available.'* (Statistics South Africa, 2018b, p. 17).



Considering this in the 4th Quarter of 2018, the expanded unemployment rate in the Northern Cape stood at 38.6%. During this period the labour absorption rate in the Northern Cape was 40.3% and the labour force participation rate was 53.8%.

In respect of households, the 2011 Census indicated that there were 301 405 households in the Northern Cape with an average household size of 3.8. Of the households in the Northern Cape, 38.8% were female-headed households with 82.4% living in formal dwellings and 55.1% having either owned or were paying off their dwelling.

Regarding household services in 2011, 60.1% of households in the Northern Cape had flush toilets connected to the sewerage system. In respect of refuse removal 64% of households in the Northern Cape had their refuse removed on a weekly basis. Piped water was delivered to 45.8% of households in the Northern Cape while 85.4% of households in the Northern Cape used electricity as a means of energy for lighting.

Concerning HIV prevalence amongst prenatal women in the Northern Cape Province, in 2013 the Northern Cape had the lowest prevalence rate across South Africa at 17.5% followed by the Western Cape at 18.7%. At the same point the highest level of HIV prevalence amongst antenatal women was in KwaZulu-Natal with a prevalence rate of 40.1% while the national rate was 29.7%.

The 2013 National Antenatal Sentinel HIV Prevalence Survey extended to the district level which indicated that the Namaqua District Municipality had the lowest level of HIV prevalence across the country at 2.3% followed by the Central Karoo District at 6.9%. Of the 52 districts surveyed the Pixley Ka Seme district had the seventh-lowest level of HIV prevalence at 15.0%. It is well documented that the spread of HIV is associated with transport corridors (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Djemai, 2018; Strauss, *et al.*, 2018).

#### 6.15.1.2 *Municipal*

The project impacts the district municipality of Pixley ka Seme as well its local municipality of Umsobomvu. On a district level Pixley ka Seme covers the greatest land area and has the lowest population density at 1.80/km<sup>2</sup>. In respect of population grouping, at 93.35% black African people are the dominant population group across all districts and the Umsobomvu Local Municipality. The coloured population group dominates within the Pixley ka Seme Local Municipality. isiXhosa is the dominant home language spoken across all municipalities except Pixley ka Seme where Afrikaans is the dominant home language.

The Pixley ka Seme region is primarily a sheep farming area, also renowned for stud farms where high-quality racehorses are bred. The towns of Colesberg, Norvalspont and Noupoort all fall within the Umsobomvu Local Municipality. The economy of the area revolves around agriculture, the services industry, tourism and hospitality.

In the Pixley ka Seme district 31.6% of the population, which amounted to 186 351 people in 2011, were under 16 years of age while 62.4% were between 15 and 64 years and 6.1% were over the age of 64.

In the Umsobomvu Local Municipality 31.4% of the population of 28 376 people were under 16 years of age, while 62.8% fell between 15 and 64 years and 5.8% were over the age of 64.

In respect of sex ratio Pixley ka Seme has a higher proportion of males to females in the population at 97.6. Additionally, the Umsobomvu LM had the highest population growth rate between 2001 and 2011, at 1.83%.

The unemployment rate in the area is highest in the Umsobomvu local municipality at 33%. In respect of education, the Umsobomvu local municipality has the highest percentage with no schooling at 16.31%. Surprisingly Umsobomvu has the highest percentage of the population having a matric level of education at 23.2%.

In respect of the local municipalities associated with the proposed development, the Umsobomvu local municipality has the fewest number of households at 7 841. The average household size across the local municipality is 3.6. The percentage of female-headed households in Umsobomvu is 41.5%. A relatively low number of households across the study region ranging, between 60.3 and 46.7 percent, either own or are paying off their dwellings.

#### *6.15.2 Project Footprint*

At a project footprint specific level, the Wonderheuveld facility falls within the Umsobomvu non-urban (NU) area, Sub Place 370003002 according to Census 2011, which is sparsely populated with a population density of 0.38 people per square kilometre.

The closest urban areas to the Wonderheuveld Solar PV Energy Facility are the towns of:

- Noupport and satellite settlement of Kwazamuxolo; and
- Hanover.

#### **Noupport and Kwazamuxolo**

Calculated in a straight line, the proposed development is located about 19km south-west of the town of Noupport and the adjoining settlement of Kwazamuxolo which are situated in the Umsobomvu Local Municipality and Pixley ka Seme District Municipality in the Northern Cape Province. Attaining municipal status in 1942, Noupport functioned as a traction changeover facility on the Noupport-Bloemfontein railway line and was commercially dependent on rail activity. A decline in demand for rail services resulted in an economic decline and the degradation of the town. The satellite settlement of Kwazamuxolo is located alongside Noupport.

#### **Hanover**

Calculated along a straight line, the proposed development lies some 35km south-west of Hanover which is situated in the Emthanjeni Local Municipality and Pixley ka Seme District Municipality in the Northern Cape Province. The town was established in 1854 and served as an administrative, educational and religious centre for the surrounding area. Hanover was named after Hanover in Germany and is now situated on the N1, virtually halfway between Cape Town and Johannesburg. Prior to 1884 and due to its central position Hanover also served as a central point for travellers travelling to

the various towns and cities across South Africa. However, with the arrival of the railway, this function was to diminish changing the fortunes of the town and its inhabitants. Today the town has a certain tourist attraction with a natural spring, Anglo Boer War history, its central position and location along the N1 and within the Karoo.

## 6.16 Transportation

The Transportation Impact Assessment was conducted by Merchant Le Maitre of SiVEST. The full Transportation Impact Assessment Report is included in **Appendix 6I**. The Transportation Impact Assessment has been externally reviewed by a suitably qualified external specialist during the EIA phase (refer to **Table 3** in **section 1.4** of this report for details of specialist who undertook external review). The Transportation Impact Assessment has been based on a desktop-level assessment supported by a site investigation which was completed between the 6<sup>th</sup> to the 8<sup>th</sup> of February 2019.

### 6.16.1 Existing Traffic Conditions

#### 6.16.1.1 Roads affected by proposed Wonderheuveld PV Energy Facility

**Table 22:** Roads Affected by Wonderheuveld PV Energy Facility

Road Name	Road Number	Description	Distance (±km)
<b>Wonderheuveld</b>			
Leeupoort Road	DR2433	N10 to Paarde Valley Access Rd	21
Paarde Valley Access Rd		Leeupoort Rd to Access	9
Noupoort Road	MR0617	N10 to R389 Jct.	14
Noupoort Road	MR0617	R389 Jct to Noupoort	6
N10 Freeway	N10	N1 (Hanover) Jct to N9 (Noupoort-Middelburg) Jct.	62
N9 Freeway	N10	Middelburg to Noupoort	40
<b>TOTAL</b>			<b>152</b>

#### 6.16.1.2 Traffic Counts (Pre-Development)

The South African National Roads Agency Limited (SANRAL) has vehicle counting stations in the area which can be used in the Transportation Impact Assessment Report .

**Table 23: Traffic Counting Stations**

Traffic Counting Stations			
Counting Station	Road Name	Period	Permanent or Temporary
Hanover East (1477)	N10	1 <sup>st</sup> Jan 2018 – 31 <sup>st</sup> Dec 2018	Permanent
NR00907 / NR01005 (2733)	N9	1 <sup>st</sup> Jan 2008 – 31 <sup>st</sup> Dec 2013	Temporary

In order to get a better understanding of when the peak periods exist in the area, the data obtained from counting station N° 1477 on the N10 in **Table 23** above was compared to manual counts complete on the 7<sup>th</sup> of February 2019 at the Leeupoort / Noupoort intersection located at Km 19.92 on section N10-5.

The comparison is as follows:

**Table 24: Traffic Station Data / Counts**

Traffic Station Data / Counts									
	To N9 Middelburg				To N1 Hanover				
	Average Daily Traffic (ADT)	Average Hourly Traffic	Average Daily Truck Traffic (ADTT)	Average Hourly Truck Traffic	Average Daily Traffic (ADT)	Average Hourly Traffic	Average Daily Truck Traffic (ADTT)	Average Hourly Truck Traffic	
<b>N10 @ HANOVER EAST (No 1477)</b>									
Average Daily	282	12	136	6	145	12	145	7	
<b>N10 @ LEEUPOORT / NOUPOORT INT.</b>									
Morning 7:00-8:00		12		4		21		17	
Afternoon 16:00-17:00		18		8		14		8	

From the table above, it is clear that the average daily usage of the roads in the area is low. In addition, the morning and afternoon periods does have a slightly higher trip rate, compared to the average daily and therefore cognisance of this increase should be taken into account when additional traffic is generated and added to the existing road network.

#### 6.16.2 Access Roads & Internal Roads

The Wonderheuvel Solar PV Energy Facility development will gain access from the N10 freeway via the district road DR2433 which is currently a gravel road. It is the intention for the PV Facility to have a separate, individual access point to the development from the DR2433.

The district road DR2433 is a 'Proclaimed District Road' extending from the N10 freeway up to and including the DR2424 district road. The proposed solar PV energy facility and its access points are discussed below.

#### 6.16.2.1 Wonderheuvél Solar PV Facility – Development Access

Access to this facility will be via the existing gravel road (DR2433) which bisects the proposed PV facility. The road bisects the development into two (2) unequal quadrants, a north-eastern and south-western quadrant. Two (2) access points have been identified and the final position of these access points will be dependent on the location of the PV fields in relation to the DR2433.

A summary of each proposed access point is summarised in **Table 25** below.

**Table 25:** Wonderheuvél Solar PV Facility – Proposed Access Points

<b>Wonderheuvél Solar PV Facility – Proposed Access Points</b>	
<b>Access Point</b>	<b>Description</b>
1	<ul style="list-style-type: none"> <li>• Gravel Road access point</li> <li>• Existing access point to the north of the farm where a PV field could be considered.</li> <li>• The prescribed sight distances of 300m can be achieved</li> <li>• Priority controlled intersection is recommended with the District Road being priority.</li> <li>• Flood lines could affect the position of the PV fields</li> </ul>
2	<ul style="list-style-type: none"> <li>• Gravel Road access point</li> <li>• Existing access point to the south of the farm, where a PV field could be considered.</li> <li>• The prescribed sight distances of 300m can be achieved</li> <li>• Priority controlled intersection is recommended with the District Road being priority.</li> <li>• Flood lines and ridge lines could affect the position of the PV fields</li> </ul>

#### 6.16.2.2 Internal Roads Layout and Specifications

An internal network of roads has been assumed to be in a traditional grid pattern formation and will mainly consist of 4-12m wide gravel roads. These roads will have designed horizontal and vertical alignments to accommodate the normal and abnormal vehicles intended to be used for the delivery and maintenance of the PV equipment.

It is recommended that all internal access roads take into account where possible and applicable, the PV facility stormwater management plan so as to reduce the risks of possible erosion.

For the purpose of this assessment, it is assumed that the insitu material below the topsoil is of 'G7' quality and can be used as a suitable road subgrade material, followed by an imported 'G5' quality material as a gravel wearing course.

A suitable geotechnical study will however be required at the pre-design stage to better understand the design limitations on the development followed by a preliminary design to 'value' Engineer the project.

## 7 ENVIRONMENTAL IMPACT ASSESSMENT

### 7.1 Methodology for Assessing Impacts

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining the significance of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact

#### 7.1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 26** below.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

#### 7.1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts has also been rated.

##### 7.1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one



(1) rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

**Table 26: Rating of Impacts Criteria**

<b>ENVIRONMENTAL PARAMETER</b>		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
<b>ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE</b>		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water feature).		
<b>EXTENT (E)</b>		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
<b>PROBABILITY (P)</b>		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
<b>REVERSIBILITY (R)</b>		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible, and no mitigation measures exist.
<b>IRREPLACEABLE LOSS OF RESOURCES (L)</b>		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.

2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
<b>DURATION (D)</b>		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
<b>INTENSITY / MAGNITUDE (I / M)</b>		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
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### SIGNIFICANCE (S)

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

**Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.**

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

SiVEST's Impact Rating Methodology which was used to assess the potential impacts is set-out in detail in **Appendix 9E**.

## 7.2 Environmental Impact Assessment

Specialist studies have been conducted in terms of the stipulations contained within **Appendix 6** of the EIA Regulations, 2014 (as amended). Specialist assessments were commissioned during the Scoping phase.

As previously mentioned, the following specialist assessments were conducted prior to and during the Scoping Phase to identify and assess the issues associated with the proposed development:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment (incl. pre-construction monitoring);
- Surface Water Impact Assessment;
- Desktop Agricultural and Soils Impact Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Palaeontology Impact Assessment;
- Desktop Social Impact Assessment;
- Desktop Geotechnical Impact Assessment; and
- Transportation Impact Assessment.

These above-mentioned specialist assessments have been used to identify issues at an EIA level. These assessments were also undertaken to inform the impact assessment which took place in the EIA phase of the proposed development. In the scoping phase, the specialists assessed the entire application site as the layout of the proposed solar PV energy facility (number of modules, generation capacity and layout of arrays) was dependent on the outcome of the specialist assessments, as well as the area available for the erection of PV modules (referred to as the PV development area). During the EIA phase, once the layout of the solar PV energy facility had been determined, the above-mentioned specialist assessments were updated / revised to focus on specific impacts of the proposed PV array / development areas and solar PV energy facility infrastructure in detail. The updates / revisions included the following (where required):

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV array areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

As mentioned, another round of surveys for the Avifaunal Specialist Study was undertaken from 9 - 12 May 2019 and the results have been presented in the updated Avifaunal Specialist Study Report (**Appendix 6B**). The Avifaunal Specialist Study has thus been supplemented with site-specific information and impact ratings. In addition, field truthing for the HIA was undertaken in August 2019, through an archaeological walk down and palaeontological study covering the site<sup>15</sup>, and the results have been incorporated into this FEIAR as well as the updated HIA Report (**Appendix 6D**).

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<sup>15</sup> Aim was to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMPr

The identified impacts, thus far, are elaborated on in the sub-sections below.

### 7.2.1 Terrestrial Ecological Impacts

Potential issues relevant to impacts on the ecology of the study area, and which will be further investigated in the EIA phase, include the following:

- Impacts on biodiversity: this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- Impacts on sensitive habitats: this includes impacts on any sensitive or protected habitats, including indigenous grassland and wetland vegetation that leads to direct or indirect loss of such habitat.
- Impacts on ecosystem function: this includes impacts on any processes or factors that maintain ecosystem health and character, including the following:
  - disruption to nutrient-flow dynamics;
  - impedance of movement of material or water;
  - habitat fragmentation;
  - changes to abiotic environmental conditions;
  - changes to disturbance regimes (e.g. increased or decreased incidence of fire);
  - changes to successional processes;
  - effects on pollinators; and
  - increased invasion by alien plants.

Changes to factors such as these may lead to a reduction in the resilience of plant communities and ecosystems or loss or change in ecosystem function.

- Secondary and cumulative impacts on ecology: this includes an assessment of the impacts of the proposed development taken in combination with the impacts of other known developments for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.
- Impacts on the economic use of vegetation: this includes any impacts that affect the productivity or function of ecosystems in such a way as to reduce the economic value to users (e.g. reduction in grazing capacity, loss of harvestable products.) It is a general consideration of the impact of a proposed development on the supply of so-called ecosystem goods and services.

#### 7.2.1.1 Potential Sensitive Receptors in the General Study Area

A summary of the potential ecological issues for the study area is as follows (issues assessed by other specialists, e.g. on birds and on wetland and hydrological function, are not included here):

- Presence of natural vegetation on-site, much of which has high conservation value due to being within Critical Biodiversity Areas (CBA1 and CBA2). Although in CBAs, the vegetation types are not nationally transformed to a high degree and none are listed.

- Presence of shallow drainage valleys and associated vegetation on site, assessed as being sensitive to impacts associated with development as well as being important habitat for various plant and animal species.
- Presence of various plant species protected according to the Northern Cape Nature Conservation Act (Act 9 of 2009). The identity of such species requires detailed floristic surveys within the footprint of the proposed development.
- Potential presence of one (1) protected frog species, namely the Giant Bullfrog, not listed, but protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).
- Presence of two (2) mammal species of concern, the Black-footed Cat (Vulnerable), and Cape Clawless Otter (Near Threatened), both protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).
- Potential presence of other mammal species of concern, the South African Hedgehog (Near Threatened), Grey Rhebok, White-tailed Rat (Vulnerable) and Spectacled Dormouse (Near Threatened), the first three (3) also protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).
- Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features. There are a large number of alien invasive species present on-site or in neighbouring areas, all of which have the potential to invade more widely, given the right circumstances.

#### *7.2.1.2 Construction Phase Impacts*

##### **Direct impacts**

1. Loss and/or fragmentation of indigenous natural vegetation due to clearing;
2. Loss of individuals of plant species of conservation concern and/or protected plants;
3. Loss of faunal habitat and refugia;
4. Direct mortality of fauna due to machinery, construction and increased traffic;
5. Displacement and/or disturbance of fauna due to increased activity and noise levels; and
6. Increased poaching and/or illegal collecting due to increased access to the area.

#### *7.2.1.3 Operational Phase Impacts*

##### **On-going Direct impacts**

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

##### **Indirect impacts**

1. Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors; and
2. Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape.

#### 7.2.1.4 Decommissioning Phase Impacts

##### **Direct impacts**

These will include the following:

1. Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites;
2. Direct mortality of fauna due to machinery, construction and increased traffic; and
3. Displacement and/or disturbance of fauna due to increased activity and noise levels.

##### **Indirect impacts due to renewed disturbance due to decommissioning activities**

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

1. Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
2. Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;

#### 7.2.1.5 Assessment of Impacts

There are various impacts that have been assessed as having medium significance prior to mitigation, but for which the significance is low after mitigation. This means that, with one (1) exception, all impacts are assessed as having low significance after mitigation. The exception is the impact on indigenous natural vegetation, with a significance of medium before and after mitigation, where construction will lead to a loss of vegetation. The impact will occur, it will be permanent and is irreversible, and no mitigation can change these factors.

Please refer to **Table 27** on **page 232** for the results of the assessment of significance of ecological impacts for the solar PV energy facility.

#### 7.2.2 Avifaunal Impacts

##### 7.2.2.1 Impacts of Solar PV Facilities and Associated Infrastructure on Avifauna

Increasingly, human-induced climate change is recognised as a fundamental driver of biological processes and patterns. Historic climate change is known to have caused shifts in the geographic ranges of many plants and animals, and future climate change is expected to result in even greater redistributions of species (National Audubon Society, 2015). In 2006, the WWF Australia produced a report on the envisaged impact of climate change on birds worldwide (Wormworth, J. & Mallon, K., 2006). The report found that:

- Climate change now affects bird species' behaviour, ranges and population dynamics;
- Some bird species are already experiencing strong negative impacts from climate change;
- In future, subject to greenhouse gas emissions levels and climatic response, climate change will put large numbers bird species at risk of extinction, with estimates of extinction rates varying



from 2 to 72%, depending on the region, climate scenario and potential for birds to shift to new habitat.

Using statistical models based on the North American Breeding Bird Survey and Audubon Christmas Bird Count datasets, the National Audubon Society assessed geographic range shifts through the end of the century for 588 North American bird species during both the summer and winter seasons under a range of future climate change scenarios (National Audubon Society, 2015). Their analysis showed the following:

- 314 of 588 species modelled (53%) lose more than half of their current geographic range in all three (3) modelled scenarios.
- For 126 species, loss occurs without accompanying range expansion.
- For 188 species, loss is coupled with the potential to colonise new areas.

Climate sensitivity is an important piece of information to incorporate into conservation planning and adaptive management strategies. The persistence of many birds will depend on their ability to colonise climatically suitable areas outside of current ranges and management actions that target climate change adaptation.

South Africa is among the world's top ten (10) developing countries required to significantly reduce their carbon emissions (Seymore *et al.*, 2014), and the introduction of low-carbon technologies into the country's complement of power generation will greatly assist with achieving this important objective (Walwyn & Brent, 2015). Given that South Africa receives among the highest levels of solar radiation on earth (Fluri 2009; Munzhedi *et al.*, 2009), it is clear that solar power generation should feature prominently in future efforts to convert to a more sustainable energy mix in order to combat climate change, also from an avifaunal impact perspective. However, while the expansion of solar power generation is undoubtedly a positive development for avifauna in the longer term in that it will help reduce the effect of climate change and thus habitat transformation, it must also be acknowledged that renewable energy facilities, including solar PV facilities, in themselves have some potential for negative impacts on avifauna.

A literature review reveals a scarcity of published, scientifically examined information regarding large-scale PV plants and birds. The reason for this is mainly that large-scale PV plants are a relatively recent phenomenon. The main source of information for these types of impacts are from compliance reports and a few government-sponsored studies relating to recently constructed solar plants in the south-west United States. In South Africa, only one published scientific study has been completed on the impacts of PV plants in a South African context (Visser *et al.*, 2019).

In summary, the potential impacts of PV plants on avifauna which have emerged so far include the following:

- Displacement due to disturbance and habitat transformation associated with the construction of the solar PV plant and associated infrastructure;
- Collisions with the solar panels;
- Entrapment in perimeter fences;
- Collisions with the associated power lines; and

- Electrocutions on the associated power lines.

### **Impacts Associated with PV Plants**

#### ▪ Impact Trauma (Collisions)

This impact refers to collision-related fatality [i.e. fatality resulting from the direct contact of the bird with a project structure(s)]. This type of fatality has been occasionally documented at solar projects of all technology types (McCrary *et al.*, 1986; Hernandez *et al.*, 2014; Kagan *et al.*, 2014). In some instances, the bird is not killed outright by the collision impact, but succumbs to predation later, as it cannot avoid predators due to its injured state.

Sheet glass used in commercial and residential buildings has been well established as a hazard for birds. When the sky is reflected in the sheet glass, birds fail to see the building as an obstacle and attempt to fly through the glass, mistaking it for empty space (Loss *et al.*, 2014). Although very few cases have been reported it is possible that the reflective surfaces of solar panels could constitute a similar risk to avifauna.

An extremely rare but potentially related problem is the so-called 'lake effect' i.e. it seems possible that reflections from solar facilities' infrastructure, particularly large sheets of dark blue photovoltaic panels, may attract birds in flight across the open desert, who mistake the broad reflective surfaces for water (Kagan *et al.*, 2014)<sup>16</sup>. The unusually high percentage of waterbird mortalities at the Desert Sunlight PV facility (44%) may support the 'lake effect' hypothesis (West, 2014). Although in the case of Desert Sunlight, the proximity of evaporation ponds may act as an additional risk increasing factor, in that birds are both attracted to the water feature and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of diffusely reflected sky or horizontal polarised light source as a body of water. However, due to limited data it would be premature to make any general conclusions about the influence of the 'lake effect' or other factors that contribute to fatality of water-dependent birds. The activity and abundance of water-dependent species near solar facilities may depend on other site-specific or regional factors, such as the surrounding landscape (Walston *et al.*, 2015). However, until such time that enough scientific evidence has been collected to discount the 'lake effect' hypothesis, it must be considered as a potential source of impacts.

Weekly mortality searches at 20% coverage were conducted at the 250MW, 1300ha California Valley Solar Ranch PV site (Harvey & Associates 2014a and 2014b). According to the information that could be sourced from the internet (two quarterly reports), 152 avian mortalities were reported for the period 16 November 2013 – 15 February 2014, and 54 for the period 16 February 2014 – 15 May 2014, of which approximately 90% were based on feathers spots which precluded a finding on the cause of death. These figures give an estimated unadjusted 1 030 mortalities per year, which is obviously an underestimate as it does not include adjustments for carcasses removed by scavengers and missed by searchers. The authors stated clearly that these quarterly reports do not include the results of searcher efficiency trials, carcass removal trials, or data analyses, nor does it include detailed discussions.

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<sup>16</sup> This could either result in birds colliding directly with the solar panels or getting stranded and unable to take off again because many aquatic bird species find it very difficult and sometimes impossible to take off from dry land e.g. grebes and cormorants. This exposes them to predation, even if they do not get injured through direct collisions with the panels

In a report by the National Fish and Wildlife Forensic Laboratory (Kagan *et al.*, 2014), the cause of avian mortalities was estimated based on opportunistic avian carcass collections at several solar facilities, including the 550MW, 1 600ha Desert Sunlight PV plant. Impact trauma emerged as the highest identifiable cause of avian mortality, but most mortality could not be traced to an identifiable cause.

Walston *et al.* (2015) conducted a comprehensive review of avian fatality data from large-scale solar facilities (all technology types) in the USA. Collision as cause of death (19 birds) ranked second at Desert Sunlight PV plant and California Valley Solar Ranch (CVSR) PV plant, after unknown causes. Cause of death could not be determined for over 50% of the fatality observations and many carcasses included in these analyses consisted only of feather spots (feathers concentrated together in a small area) or partial carcasses, thus making determination of cause of death difficult. It is anticipated that some unknown fatalities were caused by predation or some other factor unrelated to the solar project. However, they found that the lack of systematic data collection and standardisation was a major impediment in establishing the actual extent and causes of fatalities across all projects.

The only scientific investigation of potential avifaunal impacts that has been performed at a South African PV facility was completed in 2016 at the 96MW Jasper PV solar facility (28°17'53"S, 23°21'56"E) which is located on the Humansrus Farm, approximately 4km south-east of Groenwater and 30km east of Postmasburg in the Northern Cape Province (Visser *et al.*, 2019). The Jasper PV facility contains 325 360 solar panels over a footprint of 180ha with the capacity to deliver 180 000 MWh of renewable electricity annually. The solar panels face north at a fixed 20° angle, reaching a height of approximately 1.86m relative to ground level with a distance of 3.11m between successive rows of panels. Mortality surveys were conducted from the 14<sup>th</sup> of September 2015 until the 6<sup>th</sup> of December 2015, with a total of seven (7) mortalities recorded among the solar panels which gives an average rate of 0.003 birds per ha surveyed per month. All fatalities were inferred from feather spots. Extrapolated bird mortality within the solar field at the Jasper PV facility was 435 birds/yr (95% CI 133 - 805). The broad confidence intervals result from the small number of birds detected. The mortality estimate is likely conservative because detection probabilities were based on intact birds, and probably decrease for older carcasses and feather spots. The study concluded *inter alia* that the short study period, and lack of comparable results from other sources made it difficult to provide a meaningful assessment of avian mortality at PV facilities. It further stated that despite these limitations, the few bird fatalities that were recorded might suggest that there is no significant collision-related mortality at the study site. The conclusion was that to understand the risk of solar energy development on birds fully, further collation and analysis of data from solar energy facilities across spatial and temporal scales, based on scientifically rigorous research designs, is required (Visser *et al.*, 2019).

The results of the available literature lack compelling evidence of collisions as a cause of large-scale mortality among birds at PV facilities. However, it is clear from this limited literature survey that the lack of systematic and standardised data collection is a major problem in the assessment of the causes and extent of avian mortality at all types of solar facilities, regardless of the technology employed. Until statistically tested results emerge from existing compliance programmes and more dedicated scientific research, conclusions will inevitably be largely speculative and based on professional opinion.

- Entrapment in Perimeter Fences

Visser *et al* (2019) recorded a fence-line fatality (Orange River Francolin *Scleroptila gutturalis*) resulting from the bird being trapped between the inner and outer perimeter fence of the facility. This was further

supported by observations of large-bodied birds unable to escape from between the two (2) fences (e.g. Red-crested Korhaan *Lophotis ruficrista*) (Visser *et al.*, 2019). Considering that one would expect the birds to be able to take off in the lengthwise direction (parallel to the fences), it seems likely that the birds panicked when they were approached by observers and thus flew into the fence.

▪ *Displacement due to Disturbance and Habitat Transformation Associated with the Construction of the Solar PV Facility*

Ground-disturbing activities affect a variety of processes in arid areas, including soil density, water infiltration rate, vulnerability to erosion, secondary plant succession, invasion by exotic plant species, and stability of cryptobiotic soil crusts. These processes have the ability, individually and together, to alter habitat quality, often to the detriment of wildlife, including avifauna. Any disturbance and alteration to the desert landscape, including the construction and decommissioning of utility-scale solar energy facilities, has the potential to increase soil erosion. Erosion can physically and physiologically affect plant species and can thus adversely influence primary production and food availability for wildlife (Lovich & Ennen, 2011).

Solar energy facilities require substantial site preparation (including the removal of vegetation) that alters topography and, thus, drainage patterns to divert the surface flow associated with rainfall away from facility infrastructure. Channelling runoff away from plant communities can have dramatic negative effects on water availability and habitat quality in arid areas. Areas deprived of runoff from sheet flow support less biomass of perennial and annual plants relative to adjacent areas with uninterrupted water-flow patterns (Lovich & Ennen, 2011).

The activities listed below are typically associated with the construction and operation of solar facilities and could have direct impacts on avifauna (County of Merced, 2014):

- Preparation of solar panel areas for installation, including vegetation clearing, grading, cut and fill;
- Excavation/trenching for water pipelines, cables, fibre-optic lines, and the septic system;
- Construction of piers and building foundations;
- Construction of new dirt or gravel roads and improvement of existing roads;
- Temporary stockpiling and side-casting of soil, construction materials, or other construction wastes;
- Soil compaction, dust, and water runoff from construction sites;
- Increased vehicle traffic;
- Short-term construction-related noise (from equipment) and visual disturbance;
- Degradation of water quality in drainages and other water bodies resulting from project runoff;
- Maintenance of fire breaks and roads; and
- Weed removal, brush clearing, and similar land management activities related to the on-going operation of the project.

These activities could have an impact on birds breeding, foraging and roosting in or in close proximity through disturbance and transformation of habitat, which could result in temporary or permanent displacement.

In a study comparing the avifaunal habitat use in PV arrays with adjoining managed grassland at airports in the USA, DeVault *et al.* (2014) found that species diversity in PV arrays was reduced compared to the grasslands (37 vs 46), supporting the view that solar development is generally detrimental to wildlife on a local-scale.

In order to identify functional and structural changes in bird communities in and around the development footprint, Visser *et al.* (2019) gathered bird transect data at the 180ha, 96MW Jasper PV solar facility in the Northern Cape, representing the solar development, boundary, and untransformed landscape. The study found both bird density and diversity per unit area was higher in the boundary and untransformed landscape, however, the extent therefore was not considered to be statistically significant. This indicates that the PV facility matrix is permeable to most species. However, key environmental features, including available habitat and vegetation quality are most likely the overriding factors influencing species' occurrence and their relative density within the development footprint. Her most significant finding was that the distribution of birds in the landscape changed, from a shrubland to open country and grassland bird community, in response to changes in the distribution and abundance of habitat resources such as food, water and nesting sites. These changes in resource availability patterns were detrimental to some bird species and beneficial to others. Shrubland specialists appeared to be negatively affected by the presence of the PV facility. In contrast, open country / grassland and generalist species, were favoured by its development (Visser *et al.*, 2019).

It is highly likely that the same pattern of reduced avifaunal densities and possible changes in densities and composition favouring grassland species will manifest itself at the proposed Wonderheuveld development.

- *Displacement due to habitat destruction and disturbance associated with the construction of the substation*

During the construction phase and maintenance of substations, some habitat destruction and transformation inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the substation servitudes through transformation of habitat, which could result in temporary or permanent displacement.

Apart from direct habitat destruction, the above-mentioned construction and maintenance activities also impact on birds through disturbance; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests.

#### *7.2.2.2 Discussion of Impacts: Wonderheuveld PV Facility*

The section below provides an overview of the envisaged impacts of the proposed Wonderheuveld PV facility on solar species.

#### **Displacement due to disturbance associated with the construction and decommissioning of the PV plants and associated infrastructure (construction and decommissioning)**

The construction (and decommissioning) of the PV plants and associated infrastructure will result in a significant amount of movement and noise, which will lead to the displacement of avifauna from the development footprints. It is highly likely that most priority species potentially occurring on the site will vacate the development footprints for the duration of these activities.

### **Displacement due to habitat transformation associated with the PV plant and associated infrastructure (operation)**

The construction of the PV plants and associated infrastructure will result in the radical transformation of the existing natural habitat. The vegetation will be cleared prior to construction commencing. Once operational, less sunlight will reach the vegetation below the solar panels, which is likely to result in stunted vegetation growth and possibly complete eradication of some plant species. The natural vegetation is likely to persist in the rows between the solar panels, but it will be different to what was available before the construction of the plant, in that it will be short grassland with few (if any) shrubs.

Small to medium-sized birds are often capable of surviving in small pockets of suitable habitat and are therefore generally less affected by habitat fragmentation than larger species. It is, therefore, possible that the smaller and medium-sized species (e.g. passerines) recorded at the site will continue to use the habitat available within the solar facility, albeit at reduced densities for some, especially as far as shrubland specialists are concerned (e.g. Rufous-eared Warbler *Malcorus pectoralis*).

Larger priority species which require contiguous, unfragmented tracts of suitable habitat (e.g. large raptors, korhaans and bustards) are likely to occur at vastly reduced densities in the proposed facilities or may even be totally displaced. The only larger priority species, which was regularly encountered during surveys at the site, was the locally Near Threatened Blue Crane. According to Marnewick *et al.* (2015) the Karoo population is estimated to be around 10 800 birds and relatively stable in largely untransformed landscapes. The displacement impact on the regional population, should it occur, should therefore be low. Two (2) other large terrestrial species were recorded in the study area, namely the locally Endangered Ludwig's Bustard and locally Vulnerable Secretary bird. None of these two (2) wide-ranging species is likely to be severely impacted on a regional level by the likely displacement resulting from the transformation of 4 800ha of Grassy Karoo habitat.

In the case of some priority raptors (e.g. Southern Pale Chanting Goshawk, Lanner Falcon, Jackal Buzzard, Black-shouldered Kite and Steppe Buzzard) the potential availability of carcasses or injured birds due to collisions with the solar panels, and enhanced prey visibility (e.g. insects, reptiles and rodents) in the short grassland between the solar panels may attract them to the area. Jeal (2017) recorded large numbers of Barn Owls at the Bokpoort parabolic trough CSP facility near Groblershoop in the Northern Cape, roosting in the 'torque tubes' that support the parabolic mirrors. While this influx of owls may have been because of a lack of suitable roosting substrate in the surrounding rangeland, the enhanced prey visibility due to the sparse vegetation cover in the plant itself may also have played a role in attracting the owls. Greater Kestrel and Rock Kestrel could also be attracted to the solar panels as perches from where to hunt for rodent and insect prey.

Cape Sparrows (*Passer melanurus*), Cape Turtle Doves (*Streptopelia capicola*) and other small birds will very likely attempt to nest underneath the solar panels to take advantage of the shade, but this should not adversely affect the operation of the equipment.

**Table 16 in section 6.8.1 on page 129** lists the solar priority species that could potentially be displaced due to habitat transformation<sup>17</sup>.

#### **Collisions with the solar panels (operation)**

The priority species that may possibly occur in the development area which could potentially be exposed to collision risk are listed in **Table 16 in section 6.8.1 on page 129**. In addition, the so-called 'lake effect' could act as a potential attraction to water birds. It is not possible to tell whether this will happen until post-construction monitoring reveals actual mortality at the site, but the lack of permanent water bodies with large waterbird populations in close vicinity to the proposed development area decreases the probability of the lake effect being a major source of mortality.

#### **Entrapment in perimeter fences**

Priority species such as Karoo Korhaan, Northern Black Korhaan, Blue Korhaan and Ludwig's Bustard may be vulnerable to entrapment between double perimeter fences. The possibility of using a single perimeter fence should be investigated. Alternatively, the two (2) fences should be placed far apart enough for birds to be able to take off if they somehow end up between the two (2) fences. In addition, staff should be sensitised not to panic birds when they discover them trapped between the fences but to approach them with caution to give them time to escape by taking off in a lengthwise direction.

#### **Impact on the solar infrastructure**

An impact that could potentially materialise is the pollution of the solar panels by faecal deposits of large birds, particularly Pied Crows and raptors, if they regularly perch on the panels. It is expected that the regular cleaning and maintenance activities should prevent this from becoming a problem.

#### **Displacement due to the habitat transformation in the proposed substations**

In the present instance, the risk of permanent displacement of priority species due to habitat transformation in the footprint of the proposed substation servitudes is likely to be very limited given the small size of the footprint. The displacement is likely to only affect small, locally common species and should have a negligible impact on local populations.

The significance of the avifaunal related impacts associated with the proposed PV facility are detailed in **Table 27 on page 232**.

### *7.2.3 Surface Water Impacts*

As mentioned, a site visit was undertaken from the 5<sup>th</sup> to the 7<sup>th</sup> of February 2019. The following surface water-related impacts are discussed in detail below.

From a watercourse perspective, this section will identify and contextualise the potential impacts within the context of the proposed development and the identified watercourses. This section will rate the impacts according to an impact rating system (see Appendix B of Surface Water Impact Assessment for a full methodology and description of the impact rating system), determine the effect of the environmental impact, and provide recommendations towards mitigating the anticipated impact. The

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<sup>17</sup> In some instances, the displacement will not be complete, but will result in lower densities

identification and rating of impacts will be undertaken (where applicable) for the construction and operation phases of the proposed development. It must be noted that the impact assessment determines a pre-mitigation rating (impacts based on current layout as is) and post-mitigation impact rating (impacts based on implementation of mitigation measures). Therefore, the impact assessment assumes automatic implementation of mitigation measures for the post-mitigation ratings.

#### 7.2.3.1 Construction Phase Potential Impacts

##### **Impacts to the Watercourses**

During the construction phase, watercourses may be disturbed due to nearby construction. Note that no direct clearance of watercourses will take place, as the development footprint has been positioned outside of the extent of the delineated watercourse. Limited clearance of vegetation in the terrestrial area will be undertaken where the PV panels, operation and maintenance building, underground cable trenching and internal roads are to be constructed. It is expected that vegetation clearance will only take place potentially up to the edge of the watercourses. Edge effects afford opportunities to alien vegetation to colonise the Watercourses. Additionally, the disturbance may result in temporary displacement of the biota inhabiting the watercourses during construction. However, these biota may well return following the construction phase, assuming strict adherence to mitigation measures.

##### **Impacts to the Hydrology of the Watercourse**

With the clearance of vegetation and increased run-off potential, the alteration of the hydrology of the watercourses can be expected. Increased flood peaks during and following rainfall events are likely whilst surfaces remain exposed following clearance and compaction during construction. However, it must be noted that the region is semi-arid, and the watercourses are non-perennial systems. Hence, flows are fairly infrequent and the impacts to the hydrology will be temporary / short-lived. Should adequate measures be implemented, the potential impacts can be successfully mitigated.

##### **Impacts to Water Quality**

During the construction process, potential contamination impacts can be expected as a result of stored oils, fuels, and other hazardous substances or materials being transported *via* stormwater run-off and / or direct leaks from construction vehicles and machinery. Should this occur, contamination impacts are likely to occur.

Water quality impacts can also result from workers using the watercourses for various purposes (such as for sanitation). Usage of sanitary substances (for example, soap) in the watercourses can alter the chemical balance or water quality thereby causing pollution to these hydrological systems. Additionally, usage of watercourses for urine and faecal waste is another potential negative water quality impact. Use of water for building purposes can also lead to impaired water quality.

Mixing cement and cleaning construction tools in the watercourses can furthermore affect the water quality. Impacts to the water quality may affect any organisms or vegetation inhabiting these systems *via* contamination impacts.

Lastly, water quality can be impaired as a result of sedimentation. Additional sediment loads emanating from construction areas that are contained in run-off entering watercourses can be regarded as pollution in accordance with the NWA, and therefore requires mitigation.



### 7.2.3.2 Operational Phase Potential Impacts

#### **Impacts to the Hydrology of the Watercourse**

Once the proposed development is in operation, increased run-off, associated erosion and sedimentation impacts from stormwater is likely. The impact of stormwater run-off is primarily related to the types of structures and surfaces that will need to be established for the proposed development. Hard impermeable surfaces will be associated with the PV cells, internal access roads, and maintenance and operation buildings. In general, flat and hard surfaces aid with the generation and acceleration of run-off which can impact on the watercourses through the alteration of flood peaks as well as other knock-on effects including onset of erosion and increased sedimentation. The increase in hardened surfaces is likely to cause a reduction in the groundwater recharge, and the drainage off of the panels is likely to be high energy, and thus pose an erosion risk to the area directly below the panels.

In addition, the PV cells will require water for cleaning of the panels to ensure that dust build up doesn't cause reduced efficiency of the panels.

### 7.2.3.3 Decommissioning Phase Potential Impacts

#### **Decommissioning Impacts**

Should the proposed development need to be decommissioned, the same impacts as identified for the construction phase of the proposed development can be anticipated. Similar potential impacts can therefore be expected to occur and the stipulated mitigation measures (where relevant) must be employed as appropriate to minimise impacts.

The significance of the surface water-related impacts associated with the proposed PV facility are detailed in **Table 27** on **page 232**.

### 7.2.4 Agricultural and Soils Impacts

#### 7.2.4.1 Identification and Assessment of Impacts on Agriculture

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or future agricultural production. If there will be no impact on production, then there is no agricultural impact. Impacts that degrade the agricultural resource base pose a threat to production and therefore are within the scope of an agricultural impact assessment. Lifestyle impacts on the resident farming community, for example visual impacts, do not necessarily impact agricultural production and, if they do not, are not relevant to and within the scope of an agricultural impact assessment. Such impacts are better addressed within the impact assessments of other disciplines included in the EIA process.

For agricultural impacts, the exact nature of the different infrastructure within the facility has very little bearing on the significance of impacts. What is of most relevance is simply the occupation of the land, and whether it is being occupied by a solar array, a road, a building or a substation makes no difference. What is of most relevance therefore is simply the total footprint of the facility.

The ways in which the proposed development can impact on soils, agricultural resources and productivity are:

- Occupation of the land by the total physical footprint of the proposed development including all PV panels, roads and electrical infrastructure; and
- Disturbance and changes to the land surface characteristics and soil profile from constructional activities such as levelling and excavations as well as the establishment of hard surfaces. These may lead to erosion and land degradation.

The significance of all potential agricultural impacts is kept low by the low agricultural potential of the land and the consequent low agricultural sensitivity to the loss of this land for agriculture.

### **Impacts of the Solar PV Facility**

Three (3) potential agricultural impacts have been identified. Two (2) of these are direct, negative impacts and apply to all three (3) phases of the proposed development (namely construction, operational and decommissioning). They are:

- Loss of agricultural land use:  
Agricultural grazing land directly occupied by the development infrastructure will become unavailable for agricultural use.
- Soil degradation:  
Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction-related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction-related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.

The third impact is a positive, indirect impact and only applies to the operational phase:

- Increased financial security for farming operations:  
Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and thereby improve farming operations.

The significance of the agricultural and soils related impacts associated with the proposed PV facility are detailed in **Table 27** on **page 232**.

## 7.2.5 Geotechnical Impacts

The geotechnical related impacts associated with the proposed development are discussed in detail below.

### 7.2.5.1 Preliminary Geological & Geotechnical Impact Assessment

From a geological / geotechnical perspective, no fatal flaws have been identified that would prevent the construction of the proposed development at this site.

Further intrusive investigation is recommended for detailed design purposes.

#### **Impact of the Proposed Development on the Geological Environment**

The impact of the project alternatives on the geological environment will predominantly relate to the impact that the proposed development will have on the soils / rock units beneath the site. Various outcrops / boulders have been noted across the sites generally associated with ridges. Removal of the boulders (during site clearing) and construction on hilltops and ridge tops, may have a negative (aesthetic / visual) impact on the environment (besides increasing the cost of site preparation in these areas). It is assumed that a visual impact will be undertaken by others.

Both vertebrate and invertebrate fossils have also been found in the Beaufort Group of the Karoo Supergroup. Reptiles, mammal-like reptile (therapsid), amphibian, fish, insect and plant fossils have been discovered (Johnson, 2006). Excavation into the rock and removal of the material will potentially result in damage / destruction of the fossils. The locations of the fossils will have to be determined during an archaeological/palaeontological investigation.

The main potential impact of the project on the geological environment will be the increased potential for soil erosion, caused by the removal of vegetation and the construction activities. Removal of vegetation for terrace preparation and compaction during earthworks will reduce the infiltration of rainwater and therefore increase surface runoff. An increase in runoff will lead to an increase in erosion. Potential impacts of the proposed development on the soils are provided below. The proposed duration of the construction phase was not provided at the time that this report was compiled. For the purpose of the assessment, a construction duration of one (1) year was assumed. Please note that the impact rating will change should the construction duration increase. A description of the weighting system and description of terms used is attached in Annexure A of the Geotechnical Impact Assessment Report (**Appendix 6C**).

The impact of the Wonderheuvel PV facility on the general environment was found to be Low. Areas with steep slopes associated with slope instability and surface bedrock/boulders associated with ridges, where construction will be difficult, have been identified.

It is the specialist's professional opinion that the proposed development of the Wonderheuvel PV Facility may go ahead, if all mitigation measures given in the Geotechnical Impact Assessment Report are implemented.

The significance of the geotechnical related impacts associated with the proposed PV facility are detailed in **Table 27** on **page 232**.

### 7.2.6 Visual Impacts

The visual impacts associated with the proposed development are discussed in detail below.

#### 7.2.6.1 Generic Visual Impacts Associated with the Solar PV Energy Facility

In this section, the typical visual issues related to the establishment of solar PV facilities as proposed are discussed. It is important to note that the renewable energy industry is still relatively new in South Africa and as such this report draws on international literature and web material (of which there is significant material available) to describe the generic impacts associated with solar energy facilities.

#### **Solar PV Fields**

The solar power component of the proposed energy generation facility consists of PV panels, which grouped together form a 'solar field'. Each PV panel is a large structure that is typically up to 4m high (equivalent in height to a one-storey building). The height of these objects will make them visible, especially in the context of a relatively flat landscape.

More importantly, the concentration of these panels will make them highly visible, depending on the number of panels in each solar field. Solar fields with a large spatial extent (footprint) will become distinctly visible features that contrast with the landscape, especially where the landscape is natural in character or undeveloped. In this context the solar field could be considered to be a visual intrusion, potentially altering the visual environment towards a more industrial character.

The establishment of PV facilities generally requires the clearance of taller vegetation such as trees and shrubs. This will intensify the visual prominence of the solar energy facility, particularly in natural locations where little transformation has taken place.

#### **Associated On-Site Infrastructure**

The infrastructure typically associated with a solar PV energy facility will include the following:

- Internal access roads between 4m and 12m wide;
- Temporary construction laydown/staging areas;
- Operation and maintenance buildings; and
- Medium voltage, underground cabling (where feasible) connecting the PV plant to the grid connection infrastructure.

Surface clearance for cable trenches, access roads and laydown areas may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Buildings placed in prominent positions such as on ridge tops may break the natural skyline,

drawing the attention of the viewer. In addition, security lighting on the site may impact on the nightscape (refer to **section 7.2.6.2** below).

#### *7.2.6.2 Night-Time Impacts*

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely to have a significant impact on the nightscape. In contrast, introducing new light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed wind farm at night.

Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement. As a result, relatively few light sources are present in the broader area surrounding the proposed development site. The closest built-up areas are the towns of Noupoot and Middelburg which are both situated more than 30km from the application sites and are thus too far away to have significant impacts on the night scene. At night, the general study area is characterised by a picturesque dark starry sky and the visual character of the night environment across the broader area is largely 'unpolluted' and pristine. Sources of light in the area are largely limited to isolated lighting from surrounding farmsteads and transient light from the passing cars travelling along the N10 national route.

Given the scale of the proposed solar PV facilities, the operational and security lighting required for the proposed development is likely to intrude on the nightscape and create glare, which will contrast with the dark backdrop of the surrounding area.

Power lines and associated towers or pylons are not generally lit up at night and, thus light spill is likely to emanate from the proposed on-site and collector substations. Lighting from these facilities is therefore expected to intrude on the nightscape to some degree. It should however be noted that the grid connection infrastructure will only be constructed if the proposed solar PV facilities are developed and thus the lighting impacts from the proposed substations would be subsumed by the glare and contrast of the lights associated with the PV facilities. As such, the grid connection infrastructure is not expected to result in significant lighting impacts.

#### *7.2.6.3 Overall Visual Impact Rating*

The EIA Regulations, 2014 (as amended) require that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. **Table 27** on **page 232** presents the impact matrix for visual impacts associated with the proposed construction and operation of the Wonderheuvel Solar PV Energy Facility. Preliminary mitigation measures have determined based on best practice and literature reviews.

## 7.2.7 Heritage Impacts

### 7.2.7.1 Impact Ratings

After consideration of the proposed layout in relation to the heritage resource, the significance of the heritage impacts associated with the proposed PV facility are detailed in **Table 27** on **page 232**.

## 7.2.8 Palaeontological Impacts

Impact on Palaeontological Heritage will only occur during the construction phase of the proposed development with no impacts on the pre-construction, operational and decommissioning phases. Impacts will only occur when the vegetation is cleared and levelled, and excavations into the bedrock will occur.

The Nature of the Impact is to Damage, destroy or permanently seal-in fossils at or below the ground surface that are unavailable for scientific study, this will occur during vegetation clearance or during the construction phase. The extent will have an effect nationally (3). Since fossil heritage is known from these formations the probability of impacts on palaeontological heritage during the construction phase is probable (3). Impacts on fossil heritage are generally irreversible (4). By taking a precautionary approach, an insignificant loss of fossil resources is expected (No Loss) (1). The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent (4).

The cumulative effect of the development of the SEF and associated infrastructure within the proposed location is considered to be High. This is as a result of the broader Middelburg and Noupport areas being considered as fossiliferous (3). Probable significant impacts on palaeontological heritage during the construction phase are high, but the intensity of the impact on fossil heritage is rated as medium as fossil heritage is common in the greater Middelburg and Noupport area (2).

Should the proposed development progress without due care to the possibility of fossils being present at the proposed site the resultant damage, destruction or inadvertent relocation of any affected fossils will be permanent and irreversible. Thus, any fossils occurring within the area are potentially scientifically and culturally significant and any negative impact on them would be of high significance (without the implementation of mitigation measures).

### 7.2.8.1 Impact Ratings

The significance of the palaeontological impacts associated with the proposed PV facility are detailed in **Table 27** on **page 232**.

## 7.2.9 Social Impacts

The social impacts associated with the proposed development are discussed in detail below.

### 7.2.9.1 Identification of Potential Impacts

The social impact variables considered across the proposed development are in accordance with Vanclay's list of social impact variables clustered under the following main categories as adapted by Wong (Vanclay, 2002; Wong, 2013) and include;

1. Health and social well-being;
2. Quality of the living environment (Liveability);
3. Economic; and
4. Cultural.

These categories are not exclusive and at times tend to overlap as certain processes may have an impact within more than one (1) category.

Under the following section the solar PV energy facility and associated infrastructure is considered and assessed in respect of these impacts.

#### 1) **Health and Social Well-being**

The health and social well-being impacts related to the proposed development include:

- Annoyance, dust noise and shadow flicker;
- Increase in crime;
- Increased risk of HIV infections;
- Influx of construction workers and job seekers; and
- Hazard exposure.

#### Annoyance, Dust and Noise

Annoyance, dust and noise will be more evident during the construction phase of the proposed development, as construction activities will result in disruptions and the generation of dust and noise from construction vehicles and equipment. Site-specific activities such as site clearance and the deliveries of materials, equipment, plant and the transportation of the workforce along unsealed access roads will generate the most dust and noise. Dust that accumulates on foliage and grasses that is used for grazing may result in the foliage and those grasses becoming unpalatable for livestock and/or game. This may in turn have an effect on farming activities within the vicinity of the project site and along the access road over the construction period. This impact will negatively impact sensitive receptors situated within or in close proximity to the project site and could also potentially impact surrounding land users. The impact of noise and dust on surrounding land users and local farmsteads can be reduced to acceptable levels through the application of appropriate mitigation measures.

Over the operational phase of the proposed development far less disruptions, dust and noise is expected in the vicinity of the project site, however, along the unsealed access road dusts and noise can be generated by traffic travelling to and from the project site. Even at low speeds heavy vehicles could generate noise in what is a remote area, particularly if they need to at times engage low gear ratios.

#### Increase in Crime

The proposed development fall within the Noupoort Precinct which, according to Crime Stats SA, has a relatively high level of crime with a total of 530 reported crimes in 2018<sup>18</sup>. The surrounding precincts of Hanover and Middelburg also have relatively high levels of reported crime at 428 and 1 474 respectively. It is likely that these crimes are associated with the more densely populated urban areas and that the level of crime in the sparsely populated urban areas would be lower, however, there are no available statistics to confirm this. It is often opportunistic crime, stock theft, the abuse of alcohol and relationship related crimes that are associated with construction activities.

Considering the relative remoteness of the proposed development it is unlikely that the proposed development will lead to any significant increase in crime levels in the area, however, it would be prudent for the developers to ensure that processes are put in place through which any suspected criminal activities associated with the proposed development can be easily communicated and swiftly addressed. The construction phase carries with it a higher risk of associated criminal activities than would be associated with the operational phase.

#### Increased Risk of HIV Infections

At 17.5%, the Northern Cape Province has the lowest HIV prevalence rate when compared to all other South African provinces. At a district level the Pixley ka Seme DM has the seventh lowest HIV prevalence rate when compared against all district municipalities across the country. These higher prevalence rates are likely to occur within the higher density urban areas and along transport corridors. As the proposed project site falls within a sparsely populated rural area, the HIV prevalence rate within the immediate vicinity of the proposed development is likely to be low. Considering this together with the fact that sexually transmitted diseases tend to be spread by construction and transport workers (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Meintjes, Bowen, & Root, 2007; World Bank Group, 2016; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Bowen P., Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P., Govender, Edwards, & Lake, 2018) opens the area to a high risk of HIV infections. This risk is likely to peak during the construction phase of the proposed development as the construction workforce increases and material and equipment is delivered to site but is likely to subside during the operational phase.

Due to the low HIV prevalence in the area it is important that this issue be given serious attention and that the appropriate mitigation measures are implemented, and the situation is closely monitored throughout the construction and operational phases of the proposed development. The risk of the spread of HIV is most prevalent on a cumulative basis and is addressed as such under **section 7.3.7.2**.

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<sup>18</sup> According to Crime Stats SA as at 28 April 2018 [www.crimestatssa.com/precinct.php?id=798](http://www.crimestatssa.com/precinct.php?id=798)



### Influx of Construction Workers and Job Seekers

It is estimated that over the construction period of the solar PV facility, the construction workforce will average approximately 126 workers peaking at approximately 297 workers. It is likely that 75% of this workforce will be recruited from within local communities. The influx of workers could lead to the disruption of social networks with the formation of temporary relationships and an increase in pregnancy which may place pressures on local family units. Apart from this the arrival of construction workers may result in the formation of a subculture that could manifest in antisocial behaviour which conflicts with the expectations of local communities. This may result in these local communities, who are accustomed to a quiet, rural environment, becoming dissatisfied with the neighbourhood. These disruptions are, however, more likely to occur in the nearby urban areas such as Noupoot, Hanover and to a lesser degree due to the size of the population, in Middleburg, when workers seek recreational activities.

During the operational phase of the proposed development the workforce will be comprised of approximately 16 workers who will be accommodated off-site. Consequently, the risks associated with disruptions to social networks will be minimal over the operation phase of the proposed development.

### Hazard Exposure

The use of heavy equipment and vehicles and an increase in vehicle traffic within the vicinity of the construction site will result in an increased risk to the personal safety of people and animals. Of particular concern are increased hazards faced by pedestrians, cyclists and motorists with emphasis on vulnerable groups such as children and the elderly. Excavation work and trenches also pose a hazard to the safety of people, particularly children and animals, who may fall into these works and may have difficulty in getting out. However, due to the low population numbers within the vicinity of the proposed development this risk is likely to be low and the appropriate mitigation measure, such as fencing, can reduce the impact further. There will also be an increased risk of fires brought about through construction workers lighting fires for cooking and for warmth during cold periods. Nevertheless, with the recommended mitigation measures being successfully put in place this can be controlled.

## **2) Quality of the Living Environment**

The following quality of the living environment impacts are related to the proposed development:

- Disruption of daily living patterns
- Disruptions to social and community infrastructure
- Transformation of the sense of place.

### Disruption of Daily Living Patterns

If there are any disruptions to daily living patterns these are likely to be minimal and restricted to the construction phase of the proposed development. This impact will be mainly associated with the site and the main access roads. These disruptions are only likely to be associated with the delivery of materials and machinery to site and the transportation of workers to and from site.

Disruptions of daily living patterns are likely to be negligible during the operation phase of the proposed development as these will be associated with maintenance and repair activities which will be far less frequent and intense than construction activities are likely to be.

### Disruption to Social and Community Infrastructure

An increase in the population of the area as a result of the workforce associated with the proposed development has the potential to place pressure on existing community services supplies and infrastructure such as schools, health care facilities, access to water, electricity and sanitary services. With the workforce associated with the construction phase of the solar PV facility peaking at approximately 297 people, of which 75% are likely to be recruited locally, it is unlikely that in isolation the proposed development will have any significant effect on social and community infrastructure in the area. However, on a cumulative basis, considering the activities taking place and planned for the area, there is likely to be a significant impact in this regard. This impact is dealt with in greater depth under **section 7.3.7**.

Over the operational phase of the project, with a smaller workforce being recruited locally, it is unlikely that there will be significant disruptions to community and social infrastructure.

### Transformation of the Sense of Place

Within a social context a sense of place includes a wide range of criteria, all or some of which add meaning to a particular area for individuals and groups. These criteria may include the vista, geography, urban layout, flora and fauna, community, history and fragrance of a place amongst many others and are uniquely interpreted on an individual basis. Some individuals may embrace changes to the sense of place that others may reject and for some it may merely be a change in the demographics of an area that leaves them feeling threatened, vulnerable and insecure. Groups and group membership can help to reinforce the sense of place of an area and can also serve to reinforce fears and suspicions associated with pending changes to the sense of place. A sense of place has much to do with unique individual perceptions attached to the location and is subjective by nature.

One (1) of these criteria is the visual aspect, which was the subject of the Visual Impact Assessment specialist report in which it is indicated that:

*“The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of twenty-six (26) potentially sensitive receptors were identified in the combined study area, three (3) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from any of the proposed PV facilities or the grid connection infrastructure. Although the N10 receptor road traverses the study area, motorists travelling along this route are only expected to experience moderate impacts from the proposed solar PV facility”* (SiVEST SA (Pty) Ltd, 2019b, p. 116).

Notwithstanding this, however, the issue regarding the sense of place is likely to remain controversial as a sense of place is personal and subjective with some accepting changes to the landscape in support of renewable energy while others may reject them (Farhar, Hunter, Kirkland, & Tierney, 2010; Carlisle, Kane, Solan, & Joe, 2014).

### **3) Economic**

The economic impacts related to the proposed development include:

- Job creation and skills development; and
- Socio-economic stimulation.

### Job Creation and Skills Development

The proposed development will lead to the creation of both direct and indirect job which will have a positive economic benefit within the region. In this regard there are approximately 297 jobs associated with the construction phase of the solar PV facility and 16 with the operational phase of the facility. During construction approximately 3 569 person-months are likely to be created of which approximately 2 679 or approximately 75% will be allocated to local communities creating employment opportunities for residents of Middelburg, Noupoot and Hanover. Many of the beneficiaries are likely to be historically disadvantaged members of the community and the proposed development will provide opportunities to develop skills amongst these people. The operational phase will employ approximately 16 people full time for a period of up to 20 years.

### Socio-Economic Stimulation

Apart from these jobs the proposed development is also likely to stimulate the local economy and again this is likely to be most significant at a cumulative level. Nevertheless, there will be a significant economic contribution attached to the solar PV facility. This contribution will be in the form of disposable salaries and the purchases of services and supplies from the local communities in and around the towns of Noupoot, Hannover and Middleburg estimated at 40% of the total project value yet to be finalised.

Apart from job creation and procurement spend the proposed development will also have broader positive socio-economic impacts as far as socio-economic development contributions are concerned. Although, at the point of writing, the project developer had not as yet put a corporate social responsibility plan in place the intention is to either, fall in line with the REIPPPP BID guidelines or put an equivalent plan in place. This will create an opportunity to support the local community over the life-span of the operational phase of the proposed development which will stretch over a 20-year period. At a national level the proposed development also has the potential to contribute towards the national grid requirements as part of the Government's vision to source 10.5% of the country's energy through solar power by 2030 (Department of Energy Republic of South Africa, 2018, p. 41).

## **4) Cultural Impacts**

At a social level it is likely that any cultural impacts would be associated with sensitive archaeological and/or heritage sites that may be found. In this regard, a Heritage Impact Assessment was undertaken, and it was found that:

*"The projected impact assessment indicates that unmitigated impacts during construction can be MEDIUM to HIGH but reduced to LOW with the implementation of management measures. Impacts during the operational and decommissioning phase is projected to be LOW with the implementation of management measures.*

*These findings provide the basis for the recommendation:*

- *further field truthing through an archaeological walk down. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the Environmental Management Plan (PGS Heritage (Pty) Ltd, 2019, p. 37).*

At this point no heritage resources have been identified that could have cultural significance. If these are identified at a later point, they can be addressed in the heritage report and as such will not be pursued any further at the social level.

#### 7.2.9.2 *Impact Assessment*

These impacts are assessed in respect of the following phases of the proposed development:

- Planning and design
- Construction
- Operational
- Decommissioning, and
- The 'no-go' option.

#### **Planning and Design Phase**

It is evident that the proposed development fits with legislation and key planning and policy documentation. In this regard renewable energy facilities are supported on a national, provincial and municipal level.

However, provincial and municipal documentation also regards tourism as an important resource for the area. In addition to this there have been concerns raised regarding the cumulative effect of the proliferation of renewable energy in the region and the impact that this may have on the sense of place of the area.

#### **Construction Phase**

Most of the impacts discussed above apply over the short-term to the construction phase of the proposed development and include:

- Annoyance, dust and noise
- Increase in crime
- Increased risk of HIV infections
- Influx of construction workers and job seekers
- Hazard exposure
- Disruption of daily living patterns
- Disruptions to social and community infrastructure
- Job creation and skills development
- Socio-economic stimulation.

#### **Operational Phase**

The social impacts that apply to the operational phase of the proposed development are:

- Transformation of the sense of place; and
- Economic.
  - Job creation and skills development.
  - Socio-economic stimulation.

## **Decommissioning Phase**

If the proposed development were to be completely decommissioned the major social impacts likely to be associated with this would be the loss of jobs and revenue stream that stimulated the local economy and flowed into the municipal coffers. It is estimated that the proposed development has a lifespan of approximately 20 years and there is the possibility that after this period the solar facility could be replaced with more up-to-date technology that would extend the life of the facilities. Although the loss of a job is significant and can be devastating on an individual and family level, the total number of jobs under threat could be insignificant as the operational staff complement is estimated at a total of 48 and many of these employees will be skilled and could find alternative employment.

Decommissioning will result in a limited number of jobs being created over a short period of time as components are dismantled and the site is cleared. Although positive, this will be a rather insignificant benefit considering the size of the facilities and the time period attached to decommissioning.

Considering the time period to decommissioning, the uncertainty of what would exactly occur, and the significance of the impact in isolation it would be rather meaningless to attach assessment criteria to decommissioning at this point. However, prior to decommissioning the following mitigation measures are suggested.

Decommissioning mitigation measures:

- Ensure that a retrenchment package is in place.
- Ensure that staff have been trained in a manner that would provide them with saleable skills within the job market.
- Ensure that the site is cleared responsibly and left in a safe condition.

The significance of the social impacts mentioned above which are associated with the proposed PV facility are detailed in **Table 27** on **page 232**.

### *7.2.10 Transportation Impacts*

#### *7.2.10.1 Additional Traffic Evaluation / Assessment*

## **Construction Phase**

Based on the traffic generation calculated (section 7 of Transportation Impact Assessment Report), an additional  $\pm 68$  vehicle trips / day will be added onto the existing public road network during the peak of construction between months 2-12 of the construction program. Of the 68 vehicle trips / day, 43 vehicle trips are for the transportation of labour and will typically be in the morning between 6:00–7:00 and in the afternoons between 16:00–17:00. The remainder of the 25 vehicle trips / day will typically occur during the 'weekday midday' and equates to  $\pm 4$  vehicle trips / hour.

Therefore, in accordance with 'TMH 16 Volume 1' the warrant to complete a comprehensive 'Traffic Impact Assessment' will not be required due to the fact that the proposed development will generate less than 50 peak hour trips. It is however recommended that the intersection be discussed with SANRAL and the appropriate axillary lanes and speed reduction measures be implemented (as per

Figure 8:3 in the Transportation Impact Assessment Report) when the construction program of this development and its facilities, in addition to the adjacent developments are known.

The specific traffic needs this phase of the development will have on the environment includes, *inter alia*, the following:

- Upgrades of existing intersections;
- Reduction in vehicle speed;
- Adequate law enforcement;
- Implementation of pedestrian safety initiatives;
- Regular maintenance of farm fence, access cattle grids;
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition; and
- Continuous engagement with SANRAL and the Northern Cape Department of Roads and Public Works.

The PV facility development access will be covered under the respective headings in the sub-sections below.

#### **Operation & Maintenance Phase (O&M)**

From the information above it is therefore assumed that the employees will commute together and hence a total of 11 trips / day additional will be generated during this period onto the existing road network. In addition to the staff commuting will be the collection of waste and sanitation. These are assumed to generate an additional 2 vehicles / week onto the existing road network and therefore the sum of this phase will have a low to negligible impact.

The specific traffic needs this phase of the development will have on the environment is *inter alia*:

- Reduction in vehicle speed;
- Adequate law enforcement;
- Implementation of pedestrian safety initiatives;
- Regular maintenance of farm fence, access cattle grids;
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition; and
- Continuous engagement with SANRAL and the Northern Cape Department of Roads and Public Works.

#### **Decommissioning Phase**

An additional ±10 vehicles / day over a period of 12–18 months will be generated. The material removed will be transported back to Gauteng or the Port of Ngqura for recycling. The impact of this phase will therefore be low.

The specific traffic needs this phase of the development will have on the environment is *inter alia*;

- Reduction in vehicle speed;
- Adequate law enforcement;
- Use of dust suppressant techniques;

- Implementation of pedestrian safety initiatives;
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition; and
- Continuous engagement with SANRAL, Northern Cape Department of Roads and Public Works and the Eastern Cape Department of Roads and Public Works.

#### *7.2.10.2 Impact Rating Assessment*

The Impact Rating System takes into account the nature, scale and duration of the effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

A rating system-based points system is applied to the potential impacts on the environment and includes objective evaluations of the mitigation of the impact.

In summary, all impacts were classified as 'Low' to 'Medium' impacts with the 'Medium' impacts changing to a 'Low' impact after the implementation of suitable mitigation measures. It should however be noted that the cumulative impact of all the surrounding developments could possibly trigger a 'High' impact and therefore effective pre-mitigation measures must be implemented.

The significance of the transportation impacts mentioned above which are associated with the proposed PV facility are detailed in **Table 27** below.

**Table 27:** Assessment of identified environmental impacts (all phases) associated with the Wonderheuvvel Solar PV Energy Facility

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
<b>Construction Phase</b>																				
<b>Terrestrial Ecology</b>																				
Indigenous natural vegetation	Loss and/or fragmentation of vegetation due to clearing for construction of infrastructure.	1	4	4	2	4	2	30	-	Medium	-Use existing road infrastructure for access roads. -Avoid construction of infrastructure within sensitive habitats. -Minimise vegetation clearing and disturbance to footprint areas only. -Compile a rehabilitation programme and rehabilitate disturbed areas.	1	4	3	2	4	2	28	-	Medium
Plant species of concern and protected plants	Loss of individuals due to clearing for construction of infrastructure.	1	4	2	2	3	2	24	-	Medium	-Undertake a walk-through survey of footprint areas. -Obtain all necessary permits.	1	4	1	2	1	1	9	-	Low



ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Fauna	Loss of habitat due to clearing for construction of infrastructure	1	3	2	2	3	2	22	-	Low	-Use existing road infrastructure for access roads. -Avoid construction of infrastructure within sensitive habitats. -Minimise vegetation clearing and disturbance to footprint areas only. -Compile a rehabilitation programme and rehabilitate disturbed areas.	1	2	2	2	3	1	10	-	Low
Fauna	Direct mortality due to machinery, construction and increased traffic	1	2	2	2	1	2	16	-	Low	-Avoid construction of infrastructure within sensitive habitats. -Implement traffic control measures, including speed limits and no-go zones.	1	2	2	2	1	1	8	-	Low
Fauna	Displacement and disturbance due to increased activity and noise levels	1	2	2	2	1	2	16	-	Low	-Avoid construction of infrastructure within sensitive habitats. -Implement traffic control measures, including speed limits and no-go zones.	1	2	2	2	1	1	8	-	Low
Flora and fauna	Increased poaching and/or illegal collecting due to improved access to the area.	1	2	2	2	1	2	16	-	Low	-Strict access control to the site. -Environmental awareness education for staff and visitors. -Report any infringements to law enforcement.	1	2	2	2	1	1	8	-	Low
<b>Avifauna</b>																				
Avifauna	Displacement of priority species due to	1	3	3	4	1	3	36	-	Medium	-Construction activity should be restricted to the immediate footprint of the infrastructure.	1	3	3	2	1	3	30	-	Medium

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	disturbance associated with the construction of the PV plants and associated infrastructure										-Measures to control noise and dust should be applied according to current best practice in the industry. -Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. -The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.									
<b>Surface Water</b>																				
Watercourses – Impacts to the Watercourses	Impacts associated with disturbance and edge effects to watercourses	1	3	2	2	2	2	20	-	Low	<u>Avoiding Direct Impacts to the Watercourses</u> – No vegetation trimming and / or pruning must take place along the existing access roads running through the extent of the watercourse. However, where nearby vegetation trimming and / or pruning is required outside the extent of the watercourse, this must take place accordance with recommendations of the vegetation specialist.  <u>Preventing Temporary Increased Run-off Impacting on Watercourses</u> – Vegetation	1	3	1	1	2	1	8	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		
											clearing must take place in a phased manner, only clearing areas where construction will take place and not in areas where construction will only take place in the future.  <b><u>Preventing Littering of Watercourses</u></b> – Provide sufficient facilities for litter disposal. Regular clean-ups are required to keep the construction area and adjacent watercourses clean.  <b><u>Alien Eradication Programme</u></b> - An Alien Eradication and Removal Programme is to be compiled prior to construction and implemented for the duration of the proposed development											
Watercourse – Impacts to the Hydrology of the Watercourse	Impacts associated with accelerated run-off and associated increased flood peaks to the watercourse	2	3	2	2	1	2	20	-	Low	<b><u>Preventing Increased Run-off and associated Erosion Impacting on Watercourses</u></b> – Adequate structures, where necessary, must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and potential erosion. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV panel and	1	2	2	2	2	1	9	-	Low		

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)
										<p>power line foundations and maintenance and operation buildings can be used where required to slow run-off entering the watercourses and the associated buffer zones, thereby preventing increase in flood peaks, run-off volumes and also the likelihood of erosion.</p> <p>An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off and associated sedimentation and erosion.</p> <p>An Environmental Control Officer (ECO) must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor increased run-off and associated erosion impacts. Where additional mitigation measures are stipulated by the ECO in order to control increased run-off and erosion, this is to be undertaken accordingly.</p>									

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Watercourse – Impacts to Water Quality	Potential impacts associated with the leakage / spillage of oils, fuels and other potentially hazardous substances from construction vehicles / machinery entering run-off and flowing into the watercourse. Pollution from workers using the watercourse for sanitation and cleaning purposes; as well as sedimentation via run-off polluting the watercourse.	2	3	2	3	3	3	39	-	Medium	<p><b><u>Storage of Oils, Fuels and Hazardous Substances / Liquids</u></b> – All oils, fuels and hazardous substances or liquids must not be stored within 100m from the full extent of the watercourse and the associated buffer zone, unless such storage is unavoidable and is approved by the ECO. Where these items are stored, the storage area must be adequately bunded to contain any spillage from containers. Emergency spill kits must be available to clean up and remove spills.</p> <p><b><u>Preventing Soil and Surface Water Contamination</u></b> – All vehicles and machinery operating on the study site are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction areas. No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place within 100m of the watercourse and the associated buffer zone.</p>	1	1	2	2	3	1	9	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION										
		E	P	R	L	D	I/M	TOTAL		STATUS (+ OR -)	S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
									<p>The study site is to contain sufficient safety measures throughout the construction process. Safety measures include (but are not limited) oil spill kits and the availability of fire extinguishers. Additionally, fuel, oil or hazardous substances storage areas must be banded to 110% capacity to prevent oil or fuel contamination of the ground and / or nearby watercourses and the associated buffer zones.</p> <p>No cement mixing is to take place in the watercourse or the associated buffer zone. In general, any cement mixing should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. Cement / concrete can also be trucked in ready-mix vehicles. Importantly, no mixing of cement or concrete directly within the watercourse and associated buffer zone.</p> <p>No "long drop" toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed</p>											

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION										
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S	
										<p>at least 100 meters from the watercourse and the associated buffer zone where required. Temporary chemical sanitation facilities must be checked regularly for maintenance purposes and cleaned often to prevent spills.</p> <p><b><u>Preventing Sedimentation Impacting on Surface Water Resources</u></b> – Adequate structures, where required, must be put into place (temporary or permanent where necessary in extreme cases) to deal with sedimentation. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV panel and power line foundations, and maintenance and operation buildings can be used where required to prevent and / or reduce sediments entering the watercourse and the associated buffer zone.</p> <p>An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation.</p>											

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION																							
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S															
												An ECO must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor sedimentation impacts. Where additional mitigation measures are stipulated by the ECO in order to control sedimentation, this is to be undertaken accordingly.																							
<b>Agriculture and Soils</b>																																			
Agricultural land	Loss of agricultural land-use due to direct occupation	1	4	2	2	3	2	24	-	Medium	None	1	4	2	2	3	2	24	-	Medium															
Soil	Soil degradation and erosion	1	2	2	2	2	2	18	-	Low	- Control run-off - Maintain vegetation cover - Strip, stockpile and re-spread topsoil	1	1	2	2	2	2	16	-	Low															
<b>Geotechnical</b>																																			
Soils	Soil disturbance during construction at the PV Facility may destabilise the soil and lead to soil erosion. - Increased soil erosion / runoff due	1	4	2	1	1	1	9	-	Low	- Use of berms and drainage channels to direct water away from the construction areas where necessary - Minimise earthworks and levelling - Use existing access roads wherever possible - Rehabilitate disturbed areas as soon as possible after construction	1	2	1	1	1	1	6	-	Low															



ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	<p>to clearing of vegetation</p> <ul style="list-style-type: none"> <li>- Construction and use of access roads by heavy-duty vehicles and construction equipment may destabilise the soil and lead to soil erosion.</li> <li>- There may be spillages (petroleum / lubricants) from the vehicles</li> <li>- There may be siltation of watercourses due to increased runoff and dust</li> </ul>										<ul style="list-style-type: none"> <li>- Correct engineering design of stream and watercourse crossings</li> <li>- Correct engineering design of any new access roads</li> <li>- Maintain vehicles and only undertake repairs and maintenance work in designated areas</li> <li>- Implement groundcover measures to prevent erosion such as keeping as much natural vegetation as possible, straw mulch, erosion control mats etc.</li> <li>- Contain and control stormwater flow</li> </ul>									
<b>Visual</b>																				
<ul style="list-style-type: none"> <li>▪ Potential alteration of the visual character</li> </ul>	<ul style="list-style-type: none"> <li>▪ Large construction vehicles and equipment will alter the natural</li> </ul>	2	3	1	2	1	2	18	-	Low	<ul style="list-style-type: none"> <li>▪ Carefully plan to minimise the construction period and avoid construction delays.</li> <li>▪ Inform receptors of the construction programme and schedules.</li> </ul>	2	2	1	2	1	2	16	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		E	P	R	L	D	I/M	TOTAL		STATUS (+ OR -)	S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S	
<p>and sense of place</p> <ul style="list-style-type: none"> <li>Potential visual impact on receptors in the study area</li> </ul>	<p>character of the study area and expose visual receptors to impacts associated with construction.</p> <ul style="list-style-type: none"> <li>Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.</li> <li>Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.</li> </ul>									<ul style="list-style-type: none"> <li>Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.</li> <li>Vegetation clearing should take place in a phased manner.</li> <li>Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area [i.e. the Concentrator Photovoltaic (CPV) panel blocks] and along the site boundary.</li> <li>Maintain a neat construction site by removing rubble and waste materials regularly.</li> <li>Temporarily fence-off the construction site (for the duration of the construction period).</li> <li>Where possible, the operation and maintenance buildings and laydown areas should be consolidated to reduce visual clutter.</li> <li>Buildings and similar structures must be in keeping with relevant regional planning policy documents.</li> <li>Where possible, underground cabling should be utilised.</li> <li>Make use of existing gravel access roads where possible.</li> </ul>											

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	<ul style="list-style-type: none"> <li>Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment.</li> <li>Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.</li> </ul>										<ul style="list-style-type: none"> <li>Limit the number of vehicles and trucks travelling to and from the construction site, where possible.</li> <li>Unless there are water shortages, ensure that dust suppression techniques are implemented: <ul style="list-style-type: none"> <li>on all access roads;</li> <li>in all areas where vegetation clearing has taken place;</li> <li>on all soil stockpiles.</li> </ul> </li> </ul>									
<b>Heritage</b>																				
Impact on known Stone Age resources	Impact on stone age resources during earthmoving - including trenching, road making, foundation digging	1	2	3	4	4	2	28	-	Medium	-Review PV layout to avoid the site -Implementation of 30-meter buffer	1	1	3	2	1	2	16	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Impact on chance finds	Impact on stone age resources during earth moving - including trenching, road making, foundation digging	1	1	3	4	4	4	52	-	High	-development of chance finds procedures to be included in the EMP -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	3	4	3	2	24	-	Medium
Impact on palaeontological resources	Impact on palaeontological resources during earth moving - including trenching, road making, foundation digging	1	2	3	4	4	2	28	-	Medium	-Implement chance finds procedures -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	2	4	4	2	24	-	Medium
<b>Palaeontology</b>																				
Fossil Heritage	Excavations and site clearance of the development will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock.	1	2	4	4	4	4	60	-	High	A palaeontologist must conduct a field visit after vegetation clearance. Fossil Excavation will need a SAHRA permit. If an excavation is impossible, the fossil and locality could be protected and the development moved	1	1	4	4	4	2	28	-	Medium
<b>Social</b>																				

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Annoyance, dust and noise	Annoyance, dust and noise generated through construction activities.	1	3	1	2	1	2	16	-	Low	-Apply appropriate dust suppressant to gravel roads on a regular basis -Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. -Ensure all vehicles are roadworthy and drivers are qualified and made aware of the potential noise and dust issues. -Appoint a community liaison officer to deal with complaints and grievances from the public.	1	3	1	2	1	1	8	-	Low
Increase in crime	An increase in crime associated with the construction phase of the project.	2	3	2	2	2	3	33	-	Medium	-All workers should carry identification cards and wear identifiable clothing. -Fence off the construction site and control access to the site. -Appoint an independent security company to monitor the site. -Appoint a community liaison officer. -Encourage local people to report any suspicious activity associated with the construction site to the community liaison officer. -A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor	2	3	2	2	2	2	22	-	Low

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S					
												and sub-contractors remain responsible and accountable. This will also facilitate the identification and implementation of additional mitigation measures if required. -Prevent loitering within the vicinity of the construction camp as well as construction sites by recruiting off-site via an offsite recruiting office/agent, whatever is most appropriate.													
Increased risk of HIV and AIDS	Increased risk of HIV and AIDS due to the influx of workers, job seekers and deliveries and availability of disposable income.	3	3	3	3	4	3	48	-	High	-Ensure that an on-site HIV and AIDS policy is in place and that construction workers are exposed to a health and HIV/AIDS awareness educational programme within the first month of construction. -Provide voluntary and free counselling, free testing and condom distribution services to the workforce. -Where feasible extend the HIV/AIDS programme into the community with specific focus on schools and youth clubs.	3	3	3	3	4	2	32	-	Medium					
Influx of construction workers and job seekers	Influx of construction workers and job seekers resulting in a temporary change in demographics	2	3	2	2	2	2	22	-	Low	-Communicate, through Community Leaders and Ward Councillors, the limitation of opportunities created by the project to prevent an influx of job seekers. -Develop and implement a local procurement policy which prioritises "locals first" to reduce	2	2	2	2	2	2	20	-	Low					

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S						
												the movement of people into the area in search of work. -Draw up a recruitment policy in conjunction with Community Leaders and Ward Councillors and ensure compliance with this policy.														
Hazard exposure	Exposure to hazards associated with construction activities and the delivery of heavy machinery and equipment to site.	2	3	2	2	1	2	20	-	Low	-Ensure all construction equipment and vehicles are properly maintained at all times. -Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly. -Ensure that fires lit by construction staff are only ignited in designated areas and that the appropriate safety precautions, such as not lighting fires in strong winds and completely extinguishing fires before leaving them unattended, are strictly adhered to. -Make staff aware of the dangers of fire during regular toolbox talks. -A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor,	2	2	2	2	1	2	18	-	Low						

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S					
												and sub-contractors remain responsible and accountable and to facilitate the identification and implementation of additional mitigation measures if required. -Where necessary training should be provided on the implementation of the grievance mechanism to ensure that those who are most likely to be affected by the project are suitably equipped in the mechanism of raising concerns and having these addressed. -Compile and implement a Fire Management and Emergency Preparedness Response Plan.													
Disruption of daily living patterns	Disruption of daily living patterns due to construction activities and deliveries of machinery and heavy equipment to site.	2	3	2	2	1	2	20	-	Low	-Ensure that, at all times, people have access to their properties as well as to social facilities. -All vehicles must be roadworthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. -Heavy vehicles should be inspected regularly to ensure their road safety worthiness. -The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged due to construction activities.	2	2	2	2	1	2	18	-	Low					



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Disruption of services supplies and infrastructure	Disruptions of community facilities and infrastructure due to construction activities and an influx of workers.	2	3	2	2	1	2	20	-	Low	Regularly monitor the effect that the construction activities is having on public infrastructure and immediately report any damage to infrastructure to the appropriate authority.	2	2	2	2	1	2	18	-	Low
Job creation and skills development	The creation of job opportunities and the development of skills amongst the workforce.	3	3	2	2	1	2	22	+	Low	-Wherever feasible, local residents should be recruited to fill semi and unskilled jobs. -Women should be given equal employment opportunities and encouraged to apply for positions. -A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction. -A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction phase.	3	3	2	2	2	2	24	+	Medium
Socio-economic development	Potential for positive socio-economic opportunities for the region associated with downstream business opportunities and	3	3	2	2	2	2	24	+	Medium	A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction phase.	3	3	2	2	3	2	26	+	Medium

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	corporate social responsibility initiatives.																			
<b>Transportation</b>																				
Additional Traffic Generation	Increase in traffic	2	3	1	2	1	2	18	-	Low	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by us -Construction of an on-site concrete batching plant to reduce trips	2	3	1	2	1	2	18	-	Low
Additional Traffic Generation	Increase of incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids -Construction of an on-site concrete batching plant to reduce trips	2	3	2	4	1	1	12	-	Low
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	1	2	20	-	Low	-Reduction in speed of the vehicles -Use of dust suppression techniques -Implement a road maintenance programme under the auspices of the respective transport department	2	3	2	2	1	2	20	-	Low

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S				
												-Construction of an on-site concrete batching plant to reduce trips												
Additional Traffic Generation	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	-Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	3	2	2	2	22	-	Low					
Abnormal Loads	Additional abnormal loads	3	2	1	2	1	1	9	-	Low	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	3	2	1	2	1	9	-	Low					
Internal Access Roads	Increase in dust from gravel roads	1	4	1	1	1	2	16	-	Low	-Enforce a maximum speed limit on the development -Use of dust suppression techniques -Adequate watering by means of water bowser	1	3	1	1	1	2	14	-	Low				
Internal Access Roads	New / larger access points	1	4	1	2	1	1	9	-	Low	-Adequate road signage according to the SARTSM -Approval from the respective roads department	1	4	1	2	1	9	-	Low					
<b>Operational Phase</b>																								

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
<b>Terrestrial Ecology</b>																				
Fauna	Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure	1	2	2	2	1	2	16	-	Low	-Implement traffic control measures, including speed limits. -Environmental awareness education for staff and visitors.	1	2	2	2	1	1	8	-	Low
Vegetation	Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	1	3	2	3	3	2	24	-	Medium	-Compile and implement Alien Invasive Management Plan. -Rehabilitate disturbed areas.	1	2	2	2	3	1	10	-	Low
Vegetation	Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape	1	3	2	3	3	2	24	-	Medium	-Compile and implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control. -Undertake regular monitoring to detect erosion features early so that they can be controlled. -Implement control measures. -Avoid building on or near steep or unstable slopes.	1	2	2	2	3	1	10	-	Low

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												-Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow														
<b>Avifauna</b>																										
Avifauna	Displacement of priority avifauna due to habitat transformation associated with the PV plant and associated infrastructure	1	4	3	3	3	3	42	-	Medium	-The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of transformed areas is concerned.	1	3	2	3	3	3	36	-	Medium						
Avifauna	Entrapment in perimeter fences resulting in the mortality of priority species.	1	3	1	2	3	1	10	-	Low	-A single perimeter fence should be used. Alternatively, the two (2) fences should be at least 4m apart to allow medium to large birds enough space to take off.	1	1	1	2	3	1	8	-	Low						
Avifauna	Collisions of priority avifauna with the solar panels resulting in the mortality of priority species.	1	2	2	2	3	1	10	-	Low	-No mitigation is required due to the very low expected magnitude	1	2	2	2	3	1	10	-	Low						
<b>Surface Water</b>																										

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Watercourse - Impacts to the Hydrology of the Watercourse	Increased run-off as well as associated erosion and sedimentation impacts	2	3	2	2	3	3	36	-	Medium	<p><b>Minimising Stormwater Impacts to Watercourses</b> – The access roads, and maintenance and operation buildings must have energy dissipating structures where required to prevent increased run-off and sediments contained in the run-off entering adjacent areas or surface water resources. This will assist in erosion prevention as well. Structures can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example). It is also recommended that the area beneath the PV panels be maintained as grass (vegetation of some sort) if possible. A buffer strip of vegetation and rock reinforcement should be maintained downslope of the PV cells, as this will allow a reduction in erosion and sedimentation from increased overland flows from the hardened surfaces.</p> <p>Alternatively, a suitable operational stormwater management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering the</p>	1	2	2	1	3	2	18	-	Low

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												watercourses thereby, also preventing erosion.  ECO monitoring is to take place during the post-construction rehabilitation phase. Monitoring is to take place for erosion as well as re-establishment of vegetation where trenching has taken place.																							
<b>Agriculture and Soils</b>																																			
Agricultural land	Loss of agricultural land-use due to direct occupation	1	4	2	2	3	2	24	-	Medium	None	1	4	2	2	3	2	24	-	Medium															
Soil	Soil degradation and erosion	1	2	2	2	2	2	18	-	Low	-Control run-off -Maintain vegetation cover -Strip, stockpile and re-spread topsoil	1	1	2	2	2	2	16	-	Low															
Financial security of farming operations	Increased financial security through rental income	1	4	1	1	3	2	20	+	Low	None	1	4	1	1	3	2	20	+	Low															
<b>Geotechnical</b>																																			
Soils	Increased soil erosion / runoff due to clearing of vegetation and alteration of natural drainage	1	2	1	1	1	1	6	-	Low	-Use existing access roads wherever possible -Correct engineering design of stream and watercourse crossings -Correct engineering design of access roads	1	2	1	1	1	1	6	-	Low															

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	(paved areas)  - There may be spillages (petroleum / lubricants) from the vehicles										-Maintain vehicles and only undertake repairs and maintenance work in designated areas -Implement groundcover measures to prevent erosion such as keeping as much natural vegetation as possible, straw mulch, erosion control mats etc. -Contain and control stormwater flow									
<b>Visual</b>																				
<ul style="list-style-type: none"> <li>Potential alteration of the visual character and sense of place.</li> <li>Potential visual impact on receptors in the study area.</li> <li>Potential visual impact on the night-time visual environment.</li> </ul>	<ul style="list-style-type: none"> <li>The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.</li> <li>The proposed solar PV facility will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts.</li> </ul>	2	3	3	3	3	2	28	-	Medium	<ul style="list-style-type: none"> <li>Restrict vegetation clearance on the site to that which is required for the correct operation of the facility.</li> <li>Ensure that the PV arrays are not located within 500m of any farmhouses in order to minimise visual impacts on these dwellings.</li> <li>Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area [i.e. the Concentrator Photovoltaic (CPV) panel blocks] and along the site boundary.</li> <li>Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter.</li> <li>As far as possible, limit the number of maintenance vehicles which are allowed to access the site.</li> </ul>	2	3	3	2	2	2	24	-	Medium



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	<ul style="list-style-type: none"> <li>Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers.</li> <li>The night-time visual environment will be altered as a result of operational and security lighting at the proposed PV facility.</li> </ul>									<ul style="list-style-type: none"> <li>Ensure that dust suppression techniques are implemented on all gravel access roads.</li> <li>As far as possible, limit the amount of security and operational lighting present on site.</li> <li>Light fittings for security at night should reflect the light toward the ground and prevent light spill.</li> <li>Lighting fixtures should make use of minimum lumen or wattage.</li> <li>Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used.</li> <li>If possible, make use of motion detectors on security lighting.</li> <li>The operations and maintenance (O&amp;M) buildings should not be illuminated at night.</li> <li>The O&amp;M buildings should be painted in natural tones that fit with the surrounding environment.</li> <li>Buildings and similar structures must be in keeping with relevant regional planning policy documents.</li> </ul>											
<b>Heritage</b>																					

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Impact on heritage resources	Impact on heritage resources during general maintenance	1	1	4	4	4	4	56	-	High	-Development of chance find procedures to be included in the EMP -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	1	14	-	Low
<b>Social</b>																				
Transformation of the sense of place	Transformation of the sense of place due to the nature of the project.	2	4	4	3	4	3	51	-	High	-Apply the mitigation measures suggested in the Visual Impact Assessment Report. Ensure that all affected landowners and tourist associations are regularly consulted. -A Grievance Mechanism should be put in place and all grievances should be dealt with in a transparent manner. -The mitigation measures recommended in the Heritage Impact Assessment should be followed.	2	4	4	3	4	2	34	-	Medium
Job creation and skills development	The creation of job opportunities and the development of skills amongst the workforce.	2	3	2	2	3	2	24	+	Medium	-Implement a training and skills development programme for locals. -Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme.	2	3	2	2	3	2	24	+	Medium
Socio-economic stimulation	Potential for positive socio-economic opportunities for the region associated with downstream business	3	3	2	3	3	2	28	+	Medium	-Ensure that the procurement policy supports local enterprises. -Establish a social responsibility programme either in line with the REIPPPP BID guidelines or equivalent.	3	3	2	3	3	3	42	+	Medium

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	opportunities and corporate social responsibility initiatives.											-Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme. -Ensure that any trusts or funds are strictly managed in respect of outcomes and funds.																										
<b>Transportation</b>																																						
Additional Traffic Generation	Increase in traffic	2	3	1	2	3	1	11	-	Low	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by bus	2	3	1	2	3	1	11	-	Low																		
Additional Traffic Generation	Increase in incidents with pedestrians and livestock	2	4	2	4	3	1	15	-	Low	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids	2	3	2	4	3	1	14	-	Low																		
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	3	1	12	-	Low	-Reduction in speed of vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department	2	3	2	2	3	1	12	-	Low																		
Additional Traffic Generation	Increase in road maintenance	2	3	2	2	3	1	12	-	Low	-Reduction in speed of vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department	2	3	2	2	3	1	12	-	Low																		

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Abnormal Loads	Additional abnormal loads	2	1	1	1	3	1	8	-	Low	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	2	1	1	1	3	1	8	-	Low
Internal Access Roads	New / larger access points	2	3	1	2	3	1	11	-	Low	-Adequate road signage according to the SARTSM	2	3	1	2	3	1	11	-	Low
<b>Decommissioning Phase</b>																				
<b>Terrestrial Ecology</b>																				
Vegetation	Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites	1	3	2	2	2	2	20	-	Low	-No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorisation from relevant authorities. -If any additional infrastructure needs to be constructed, for example overhead power lines, communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts. -No driving of vehicles off-road. -Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. -Access to sensitive areas outside of development footprint should not be permitted during operation.	1	3	2	2	2	1	10	-	Low

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												-Surface runoff and erosion must be properly controlled, and any issues addressed as quickly as possible												
Fauna	Direct mortality of fauna due to machinery, construction and increased traffic	1	2	2	2	3	2	20	-	Low	<ul style="list-style-type: none"> <li>-Personnel and vehicles to avoid sensitive habitats.</li> <li>-No speeding on access roads – install speed control measures, such as speed humps, if necessary.</li> <li>-No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard.</li> <li>-No hunting of protected species or hunting of any other species without a valid permit.</li> <li>-Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species.</li> <li>-Report any sightings to conservation authorities.</li> <li>-Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting</li> </ul>	1	2	2	1	3	1	9	-	Low				
Fauna	Displacement and/or disturbance of fauna due to increased	1	2	2	1	1	1	7	-	Low	-Restrict impact to development footprint only and limit disturbance spreading into surrounding areas.	1	2	2	1	1	1	7	-	Low				

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S				
	activity and noise levels											-Access to sensitive areas outside of infrastructure footprint should not be permitted during construction. -No speeding on access roads – install speed control measures, such as speed humps, if necessary. -No hunting of protected species. -Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. -Report any sitings to conservation authorities												
Vegetation	Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	1	3	2	3	3	2	24	-	Medium	Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. -Undertake regular monitoring to detect alien invasions early so that they can be controlled. -Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. -Do NOT use any alien plants during any rehabilitation that may be required.	1	2	2	2	3	1	10	-	Low				
Vegetation	Continued runoff and erosion due to the presence of hard surfaces that change	1	3	2	3	3	2	24	-	Medium	-Implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control.	1	2	2	2	3	1	10	-	Low				

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	the infiltration and runoff properties of the landscape										-Following decommissioning, undertake regular monitoring for an appropriate length of time to detect erosion features early so that they can be controlled. -Implement any control measures that may become necessary. -Avoid undertaking any activities on or near steep or unstable slopes.									
<b>Avifauna</b>																				
Avifauna	The decommissioning of the PV plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of priority avifauna from the site due to disturbance. It is highly likely that most priority species will temporarily vacate the site footprint.	1	3	3	4	1	3	36	-	Medium	-Activity should be restricted to the immediate footprint of the infrastructure. -Measures to control noise and dust should be applied according to current best practice in the industry. -Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. -The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the footprint and rehabilitation of disturbed areas is concerned.	1	3	3	2	1	3	30	-	Medium
<b>Surface Water</b>																				

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Watercourses – Impacts to the Watercourses	Impacts associated with disturbance and edge effects to watercourses	1	3	2	2	2	2	20	-	Low	<p><b><u>Avoiding Direct Impacts to the Watercourses</u></b> – No vegetation trimming and / or pruning must take place along the existing access roads running through the extent of the watercourse. However, where nearby vegetation trimming and / or pruning is required outside the extent of the watercourse, this must take place accordance with recommendations of the vegetation specialist.</p> <p><b><u>Preventing Temporary Increased Run-off Impacting on Watercourses</u></b> – Vegetation clearing must take place in a phased manner, only clearing areas where construction will take place and not in areas where construction will only take place in the future.</p> <p><b><u>Preventing Littering of Watercourses</u></b> – Provide sufficient facilities for litter disposal. Regular clean-ups are required to keep the construction area and adjacent watercourses clean.</p> <p><b><u>Alien Eradication Programme</u></b> - An Alien Eradication and Removal Programme is to be</p>	1	3	1	1	2	1	8	-	Low



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												compiled prior to construction and implemented for the duration of the proposed development								
Watercourse – Impacts to the Hydrology of the Watercourse	Impacts associated with accelerated run-off and associated increased flood peaks to the watercourse	2	3	2	2	1	2	20	-	Low	<p><b><u>Preventing Increased Run-off and associated Erosion Impacting on Watercourses</u></b> – Adequate structures, where necessary, must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and potential erosion. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV panel and power line foundations and maintenance and operation buildings can be used where required to slow run-off entering the watercourses and the associated buffer zones, thereby preventing increase in flood peaks, run-off volumes and also the likelihood of erosion.</p> <p>An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased</p>	1	2	2	2	2	1	9	-	Low

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											run-off and associated sedimentation and erosion.  An Environmental Control Officer (ECO) must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor increased run-off and associated erosion impacts. Where additional mitigation measures are stipulated by the ECO in order to control increased run-off and erosion, this is to be undertaken accordingly.														
Watercourse – Impacts to Water Quality	Potential impacts associated with the leakage / spillage of oils, fuels and other potentially hazardous substances from construction vehicles / machinery entering run-off and flowing into the watercourse. Pollution from workers using the watercourse for sanitation and cleaning purposes; as	2	3	2	3	3	3	39	-	Medium	<b><u>Storage of Oils, Fuels and Hazardous Substances / Liquids</u></b> – All oils, fuels and hazardous substances or liquids must not be stored within 100m from the full extent of the watercourse and the associated buffer zone, unless such storage is unavoidable and is approved by the ECO. Where these items are stored, the storage area must be adequately bunded to contain any spillage from containers. Emergency spill kits must be available to clean up and remove spills.  <b><u>Preventing Soil and Surface Water Contamination</u></b> – All vehicles and machinery	1	1	2	2	3	1	9	-	Low					

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	well as sedimentation via run-off polluting the watercourse.										operating on the study site are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction areas. No fueling, refueling, vehicle and machinery servicing or maintenance is to take place within 100m of the watercourse and the associated buffer zone.  The study site is to contain sufficient safety measures throughout the construction process. Safety measures include (but are not limited) oil spill kits and the availability of fire extinguishers. Additionally, fuel, oil or hazardous substances storage areas must be banded to 110% capacity to prevent oil or fuel contamination of the ground and / or nearby watercourses and the associated buffer zones.  No cement mixing is to take place in the watercourse or the associated buffer zone. In general, any cement mixing should take place over a bin lined (impermeable) surface or												

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										<p>alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. Cement / concrete can also be trucked in ready-mix vehicles. Importantly, no mixing of cement or concrete directly within the watercourse and associated buffer zone.</p> <p>No “long drop” toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed at least 100 meters from the watercourse and the associated buffer zone where required. Temporary chemical sanitation facilities must be checked regularly for maintenance purposes and cleaned often to prevent spills.</p> <p><b><u>Preventing Sedimentation Impacting on Surface Water Resources</u></b> – Adequate structures, where required, must be put into place (temporary or permanent where necessary in extreme cases) to deal with sedimentation. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV panel and power line</p>												

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												foundations, and maintenance and operation buildings can be used where required to prevent and / or reduce sediments entering the watercourse and the associated buffer zone.  An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation.  An ECO must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor sedimentation impacts. Where additional mitigation measures are stipulated by the ECO in order to control sedimentation, this is to be undertaken accordingly.									
<b>Agricultural and Soils</b>																					
Agricultural land	Loss of agricultural land-use due to direct occupation	1	4	2	2	3	2	24	-	Medium	None										

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Soil	Soil degradation and erosion	1	2	2	2	2	2	18	-	Low	- Control run-off - Maintain vegetation cover - Strip, stockpile and re-spread topsoil	1	1	2	2	2	2	16	-	Low
<b>Geotechnical</b>																				
Soils	Soil disturbance during decommissioning/deconstruction at the PV Facility may destabilise the soil and lead to soil erosion.  -Contamination of soil due to chemical spillages from equipment -Construction and use of access roads by heavy-duty vehicles and construction equipment may destabilise the soil and lead to soil erosion.	1	4	2	1	1	1	9	-	Low	- Use of berms and drainage channels to direct water away from the decommissioning/deconstruction areas where necessary - Minimise earthworks and levelling - use existing access roads wherever possible - Rehabilitate disturbed areas as soon as possible - Add as much natural vegetation back as possible - Try reinstate natural drainage patterns - Have chemical spill kits on-site and remove all spill material when decommissioning any substations. - Maintain vehicles and only undertake repairs and maintenance work in designated areas - Contain and control stormwater flow	1	2	1	1	1	1	6	-	Low

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	-There may be spillages (petroleum/lubricants) from the vehicles -There may be siltation of watercourses due to increased runoff and dust																			
<b>Visual</b>																				
<ul style="list-style-type: none"> <li>Potential visual intrusion resulting from vehicles and equipment involved in the decommissioning process;</li> <li>Potential visual impacts of increased dust emissions from decommissioning activities and related traffic; and</li> </ul>	<ul style="list-style-type: none"> <li>Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts.</li> <li>Decommissioning activities may be perceived as an unwelcome visual intrusion.</li> </ul>	2	3	1	2	1	2	18	-	Low	<ul style="list-style-type: none"> <li>All infrastructure that is not required for post-decommissioning use should be removed.</li> <li>Carefully plan to minimise the decommissioning period and avoid delays.</li> <li>Maintain a neat decommissioning site by removing rubble and waste materials regularly.</li> <li>Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase.</li> <li>All cleared areas should be rehabilitated as soon as possible.</li> </ul>	2	2	1	2	1	2	16	-	Low

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<ul style="list-style-type: none"> <li>Potential visual intrusion of any remaining infrastructure on the site.</li> </ul>	<ul style="list-style-type: none"> <li>Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers.</li> <li>Surface disturbance during decommissioning would expose bare soil (scarring) which could visually contrast with the surrounding environment.</li> <li>Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind</li> </ul>									<ul style="list-style-type: none"> <li>Rehabilitated areas should be monitored post-decommissioning and remedial actions implemented as required.</li> </ul>									



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	blowing over these disturbed areas could result in dust which would have a visual impact.																			
<b>Heritage</b>																				
Impact on heritage resources	Impact on heritage resources during rehabilitation work associated with decommissioning - grading trench filling etc.	1	1	4	4	4	4	56	-	High	-Development of chance find procedures to be included in the EMP -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	1	14	-	Low
<b>Transportation</b>																				
Additional Traffic Generation	Increase in traffic	2	3	1	2	1	2	18	-	Low	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by bus -Construction of an on-site concrete batching plant to reduce trips	2	3	1	2	1	2	18	-	Low
Additional Traffic Generation	Increase of incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids	2	3	2	4	1	1	12	-	Low

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S					
												-Construction of an on-site concrete batching plant to reduce trips													
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	1	2	20	-	Low	-Reduction in speed of the vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	3	2	2	1	2	20	-	Low					
Additional Traffic Generation	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	-Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	2	2	2	2	2	20	-	Low					
Abnormal Loads	Additional abnormal loads	3	2	1	2	1	1	9	-	Low	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low					
Internal Access Roads	Increase in dust from gravel roads	1	3	1	1	1	2	14	-	Low	-Enforce a maximum speed limit on the development -Use of dust suppressant techniques -Adequate watering by means of water bowser	1	3	1	1	1	2	14	-	Low					

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Internal Access Roads	New / larger access points	1	4	1	2	1	1	9	-	Low	-Adequate road signage according to the SARTSM -Approval from the respective roads department	1	4	1	2	1	1	9	-	Low
<b>Cumulative</b>																				
<b>Terrestrial Ecology</b>																				
Vegetation	Loss and/or fragmentation of indigenous natural vegetation due to clearing	2	4	4	2	4	2	32	-	Medium	-Limit development within conservation zones, especially CBA1 areas.	2	4	4	2	4	1	16	-	Low
Plant species of concern and protected plants	Loss of individuals	2	4	2	3	3	2	28	-	Medium	-It is a legal requirement to obtain permits for specimens that will be lost. -Undertake a detailed pre-construction walk-through survey will be required during a favourable season to locate any additional individuals of protected plants. -This survey must cover the footprint of all approved infrastructure, including internal access roads. -Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the	2	4	2	2	2	1	12	-	Low

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												irreplaceable loss of resources as well as the cumulative effect. -A Plant Rescue Plan must be compiled to be approved by the appropriate authorities. -Where large populations of affected species of high value are encountered, consideration should be given to shifting infrastructure to avoid such areas. -No authorisation should be given that results in the loss of populations of threatened plants. -Infrastructure should be relocated and a suitable buffer zone maintained around such populations. -An ecological management plan must be compiled for such areas.									
Ecosystems	Changes to ecological processes at a landscape level	2	2	2	3	2	2	22	-	Low	-Limit development within conservation zones, especially CBA1 areas.	2	2	2	2	2	2	20	-	Low	
Fauna	Mortality, displacement and/or disturbance	2	2	2	2	1	2	18	-	Low	-Apply site-specific mitigation measures.	2	2	2	1	1	1	8	-	Low	
Vegetation, ecosystems and habitats	General increase in the spread and invasion of new habitats by alien invasive plant species	2	3	2	3	3	2	26	-	Medium	-Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.	2	2	2	2	3	1	11	-	Low	

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S						
												-Undertake regular monitoring to detect alien invasions early so that they can be controlled. -Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. -Do NOT use any alien plants during any rehabilitation that may be required.														
Ecosystems and vegetation	Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape	3	3	2	3	4	2	30	-	Medium	-Avoid development within conservation zones, especially CBA1 areas.	3	3	2	2	4	2	28	-	Medium						
<b>Surface Water</b>																										
Watercourse - Cumulative Impacts to Hydrology of Region	Increased run-off as well as associated erosion and sedimentation impacts	2	3	2	2	3	3	36	-	Medium	<b>Minimising Stormwater Impacts to Watercourses</b> – The substation, access road, and maintenance and operation buildings must have energy dissipating structures where required to prevent increased run-off and sediments contained in the run-off entering adjacent areas or surface	2	2	2	1	3	2	20	-	Low						

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												<p>water resources. This will assist in erosion prevention as well. Structures can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example).</p> <p>Alternatively, a suitable operational stormwater management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering the watercourses thereby, also preventing erosion.</p> <p>ECO monitoring is to take place during the post-construction rehabilitation phase. Monitoring is to take place for erosion as well as re-establishment of vegetation where trenching for cabling has taken place.</p>								
<b>Agriculture and Soils</b>																				
Agricultural land	Regional loss of agricultural land and productivity	2	1	2	2	3	2	20	-	Low	-Control run-off; maintain vegetation cover; strip, stockpile and re-spread topsoil	2	1	2	2	3	2	20	-	Low
<b>Visual</b>																				



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	<p>gravel roads thus resulting in increased impacts from dust emissions and dust plumes.</p> <ul style="list-style-type: none"> <li>The night-time visual environment could be altered as a result of operational and security lighting at multiple renewable energy facilities in the broader area.</li> </ul>										<ul style="list-style-type: none"> <li>Light fittings for security at night should reflect the light toward the ground and prevent light spill.</li> <li>Lighting fixtures should make use of minimum lumen or wattage.</li> <li>Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used.</li> <li>If possible, make use of motion detectors on security lighting.</li> <li>The operations and maintenance (O&amp;M) buildings should not be illuminated at night.</li> <li>The O&amp;M buildings should be painted in natural tones that fit with the surrounding environment.</li> <li>Buildings and similar structures must be in keeping with relevant regional planning policy documents.</li> </ul>									
<b>Heritage</b>																				
Impact on heritage resources	Additional impact of the development on heritage resources adding to the current cumulative impact of existing or proposed	2	2	4	4	4	2	32	-	Medium	<p>-development of chance finds procedures to be included in the EMPr</p> <p>-Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA</p>	1	1	4	4	4	1	14	-	Low



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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
	developments in the region																			
Impact on palaeontological resources	Additional impact of the development on palaeontological resources adding to the current cumulative impact of existing or proposed developments in the region	2	2	4	4	4	2	32	-	Medium	-development of chance finds procedures to be included in the EMPr -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	1	14	-	Low
<b>Palaeontology</b>																				
Fossil Heritage	Excavations and site clearance of the development will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock.	2	2	4	4	4	2	32	-	Medium	A palaeontologist must conduct a field visit after vegetation clearance. Fossil Excavation will need a SAHRA permit. If an excavation is impossible, the fossil and locality could be protected and the development moved	1	1	4	4	4	1	14	-	Low
<b>Social</b>																				

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		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
Risk of HIV infection	Risk associated with the influx of workers in the area.	3	3	4	3	4	3	51	-	High	<p><u>Mitigation can only be implemented on a regional basis and are not project-specific.</u></p> <ul style="list-style-type: none"> <li>-Ensure that all companies coming into the area have and are implementing an effective HIV/AIDS policy.</li> <li>-Introduce HIV/AIDS awareness programs to schools and youth institutions.</li> <li>-Carefully monitor and report on the HIV status of citizens in the region.</li> <li>-Be proactive in dealing with any increase in the HIV prevalence rate in the area.</li> </ul>	3	2	4	3	4	2	32	-	Medium
Sense of place	The transformation of the sense of place of the region.	2	4	4	3	4	3	51	-	High	<p><u>Mitigation measures can only be implemented on a regional basis and are not project-specific.</u></p> <ul style="list-style-type: none"> <li>-Consider undertaking a cumulative impact assessment to evaluate the changes taking place across the area on a broader scale.</li> <li>-Form a regional workgroup tasked with addressing the effect of changes to the sense of place of the region.</li> <li>-Establish grievance mechanisms to deal with complaints associated with changes to the area.</li> <li>-Enlighten the public about the need and benefits of renewable energy.</li> </ul>	2	4	4	3	4	2	34	-	Medium

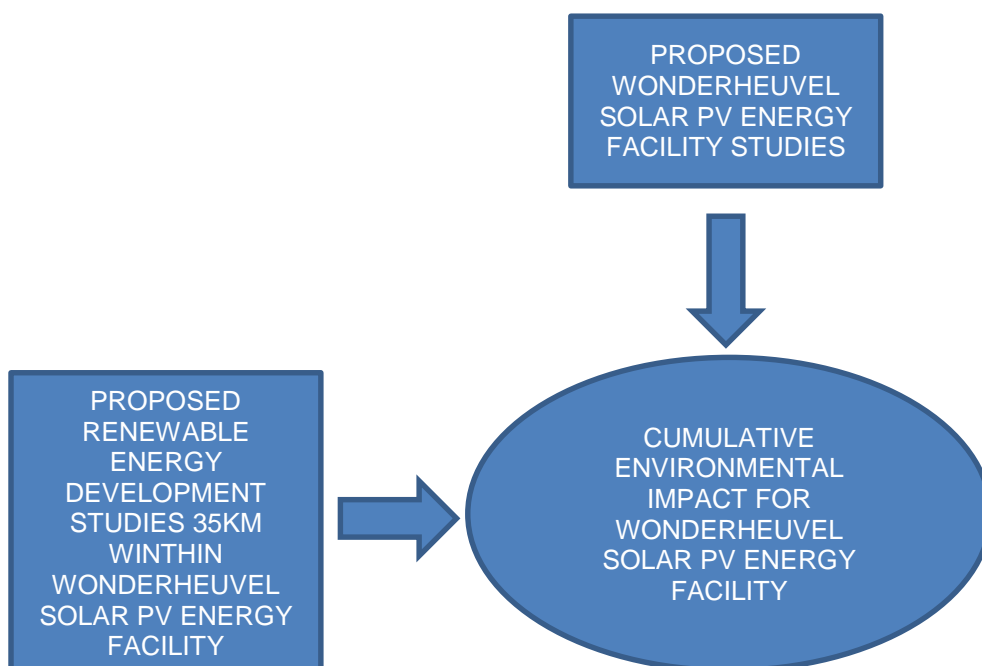
ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION													
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S					
												-Engage with the tourism businesses and authorities in the region to identify any areas of cooperation that could exist.													
Services, supplies and infrastructure	The influx of construction workers is likely to place pressure on accommodation and the need for both services and supplies.	2	3	2	2	2	2	22	-	Low	<u>Mitigation measures can only be implemented on a regional basis and are not project-specific.</u> -Engage with the municipal authorities to ensure that they are aware of the expansion planned for the area and the possible consequences of this expansion. -Ensure that local labour is recruited in respect of these developments in the area.	2	2	2	2	2	2	20	-	Low					
Economic	A proliferation of renewable energy facilities across the region is likely to result in significant and positive impacts in the area in terms of job creation, skills development, training opportunities and the creation of business opportunities for local businesses.	3	3	2	2	2	3	36	+	Medium	<u>Optimisation measures can only be implemented on a regional basis and are not project-specific.</u> -Implement a training and skills development programme for locals. -Ensure that the procurement policy supports local enterprises. -Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme. -Ensure that any trusts or funds are strictly managed in respect of outcomes and funds allocated.	3	3	2	2	2	4	48	+	High					

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
<b>Transportation</b>																				
Additional Traffic Generation	Increase in traffic	2	3	1	2	1	4	36	-	Medium	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by bus -Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area	2	3	1	2	1	2	18	-	Low
Additional Traffic Generation	Increase of incidents with pedestrians and livestock	2	4	2	4	1	4	52	-	High	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids -Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area	2	3	2	4	1	2	24	-	Low
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	1	4	40	-	Low	-Reduction in speed of the vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	3	2	2	1	2	20	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S
												-Coordination between all developers in the area								
Additional Traffic Generation	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	-Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area	2	3	2	2	2	22	-	Low	
Abnormal Loads	Additional abnormal loads	3	2	1	2	1	4	36	-	Medium	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	3	2	1	2	1	2	18	-	Low
Internal Access Roads	Increase in dust from gravel roads	1	4	1	1	1	3	24	-	Medium	-Enforce a maximum speed limit on the development -Use of dust suppressant techniques -Adequate watering by means of water bowser	1	3	1	1	1	2	14	-	Low
Internal Access Roads	New / larger access points	1	4	1	2	1	2	18	-	Low	-Adequate road signage according to the SARTSM -Approval from the respective roads department	1	4	1	2	1	1	9	-	Low

### 7.3 Assessment of Cumulative Impacts

The area has seen a notable interest from developers of various renewable energy developments, which could be associated with the energy resource potential found in the region, proximity to the grid access and its evacuation capacity, as well as other factors. Such developments, whether already approved or only proposed, need to be considered as they have the potential to create cumulative impacts, whether positive or negative, if implemented. The potential cumulative impact of the proposed solar PV energy facility in combination with other renewable energy facilities in the area have been identified and assessed per environmental aspect and mitigation measures will be identified to address the cumulative impact, where possible. Cumulative impacts were also rated as part of the impact rating system and used to determine the significance of the impacts (refer to **Table 27** in **section 7.2** above). The specialists have identified specific cumulative impacts, and these are outlined below.



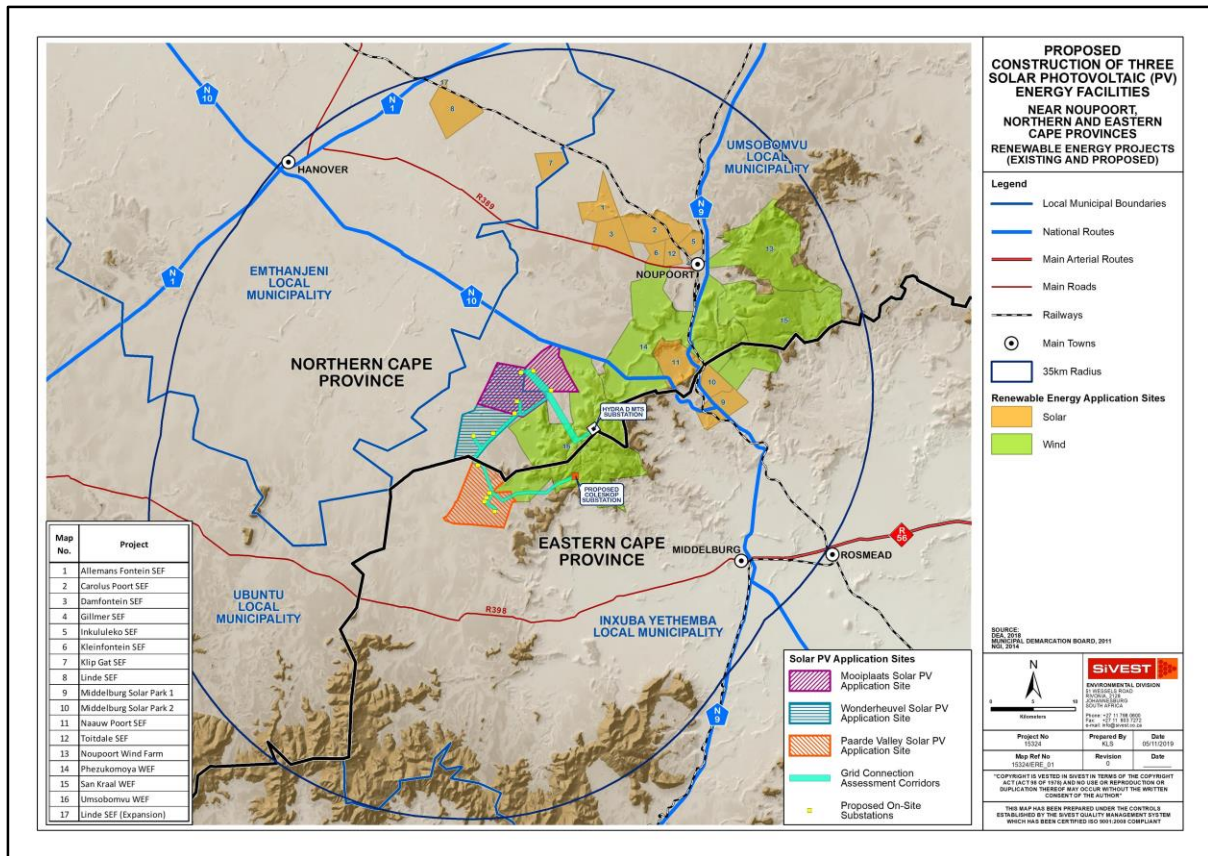
**Figure 49:** Cumulative Impact Organogram

As part of the Cumulative Impact Assessment, literature reviews of other specialist assessments / studies which were undertaken for the other renewable energy developments (both wind and solar) proposed within a 35km radius of the proposed Wonderheuvvel Solar PV Energy Facility application site (**Figure 50**) were undertaken by the respective specialists in order to ascertain any additional cumulative impacts that should be taken into consideration. A fair amount of information was available and was provided to the respective specialists to assess and incorporate into their respective assessment reports, where applicable. **Table 28** below highlights the renewable energy developments that are operational, being proposed and/or which are approved within a 35km radius of the proposed Wonderheuvvel Solar PV Energy Facility application site, as well as the various stages of the development. Their location relative to the proposed development under review is illustrated in **Figure 50**.

**Table 28:** Renewable energy developments identified within a 35km radius of the proposed Wonderheuveld Solar PV Energy Facility application site

Project	DEFF Reference No	Technology	Capacity	Status of Application / Development
Allemans Fontein SEF	14/12/16/3/3/1/730	Solar	20MW	Approved
Carolus Poort SEF	14/12/16/3/3/1/729	Solar	20MW	Approved
Damfontein SEF	14/12/16/3/3/1/728	Solar	20MW	Approved
Gillmer SEF	14/12/16/3/3/1/735	Solar	20MW	Approved
Inkululeko SEF	14/12/16/3/3/1/553	Solar	20MW	Approved
Kleinfontein SEF	12/12/20/2654	Solar	20MW	Approved
Klip Gat SEF	14/12/16/3/3/2/354	Solar	75M	Approved
Linde SEF	12/12/20/2258	Solar	40MW	In Operation
Linde SEF (Expansion)	14/12/16/3/3/1/1122	Solar	75MW	Approved
Middelburg Solar Park 1	12/12/20/2465/2	Solar	75MW	Approved
Middelburg Solar Park 2	12/12/20/2465/1	Solar	75MW	Approved
Naauw Poort SEF	14/12/16/3/3/2/355	Solar	75MW	Approved
Toitdale SEF	12/12/20/2653	Solar	20MW	Approved
Noupoort Wind Farm	12/12/20/2319	Wind	188MW	In Operation
Phezukomoya WEF	14/12/16/3/3/1/1028	Wind	315MW	EIA in Process
San Kraal WEF	14/12/16/3/3/1/1069	Wind	390MW	EIA in Process
Umsobomvu WEF	14/12/16/3/3/2/730	Wind	140MW	Approved
Mooi Plaats Solar PV	14/12/16/3/3/2/1134	Solar	400MW	EIA in process
Paarde Valley Solar PV	14/12/16/3/3/2/1136	Solar	700MW	EIA in process

The renewable energy development listed above are in different stages of planning, ranging from developments that have been constructed and are in operation, to developments where the EIAs / BAs are still being conducted.



**Figure 50:** Map showing other proposed renewable energy developments within 35km radius of the Wonderheuveld Solar PV Energy Facility application site

It should be noted that SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

The information (including specialist studies, EIA / Scoping and EMPr Reports) that could be obtained for the surrounding proposed renewable energy sites that were taken into account by the various specialists is elaborated on below.

### 7.3.1 Terrestrial Ecology

Environmental Impact Reports for a number of the renewable energy developments listed in **Table 28** above were made available to assess cumulative impacts for the current proposed development. A summary of the main impacts and associated mitigation measures are provided in **Table 29** below.



**Table 29:** Ecological impacts and proposed mitigation measures for renewable energy developments within a 35km radius of the project

Impact	Mitigation measures	Project
<ul style="list-style-type: none"> <li>▪ Loss of vegetation</li> <li>▪ Increase in runoff and erosion</li> <li>▪ Loss of and alteration of microhabitats</li> <li>▪ Establishment and spread of alien invasive species</li> <li>▪ Ecological degradation and loss of ecological integrity</li> <li>▪ Fragmentation and reduction in core habitat</li> </ul>	<ul style="list-style-type: none"> <li>▪ Make use of existing tracks</li> <li>▪ Plant search and rescue</li> <li>▪ Minimise habitat loss</li> <li>▪ Remove and collect all succulent and bulbous plants from cleared areas and transplant into newly redistributed topsoils</li> <li>▪ Prevent pollution of the environment</li> <li>▪ Re-establish vegetation where possible</li> <li>▪ Implement an invasive/exotic species eradication programme</li> <li>▪ Keep new developments close to existing developed areas and/or keep components of the new development as close together as possible.</li> <li>▪ New power lines should follow existing servitudes.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Allemans Fontein Solar Energy Facility</li> <li>▪ Carolus Poort Solar Energy Facility</li> <li>▪ Damfontein PV Solar Energy Facility</li> <li>▪ Gillmer Solar Energy Facility</li> </ul>
<ul style="list-style-type: none"> <li>▪ Loss of vegetation</li> <li>▪ Increase in runoff and erosion</li> <li>▪ Loss of and alteration of microhabitats</li> <li>▪ Altered vegetation cover</li> <li>▪ Altered distribution of rainfall</li> <li>▪ Spread and establishment of alien invasive species</li> <li>▪ Oil and chemical contamination of habitats</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use existing roads</li> <li>▪ Keep affected footprint to a minimum</li> <li>▪ Create structures under roads to permit free-flow of water</li> <li>▪ Reinforce existing roads and create berms to limit erosion</li> <li>▪ Prevent leakage of oil and other chemicals</li> <li>▪ Remove topsoil and redistribute to mimic microtopography of the original vegetation</li> <li>▪ Monitor the establishment of alien vegetation and remove as soon as detected</li> <li>▪ After decommissioning, rehabilitate disturbed areas</li> <li>▪ Maintain natural vegetation cover under panels</li> <li>▪ Place power line pylons as far as possible outside drainage lines</li> </ul>	<ul style="list-style-type: none"> <li>▪ Inkululeko Solar Energy Facility</li> </ul>
<ul style="list-style-type: none"> <li>▪ Loss of protected plants</li> <li>▪ Loss of faunal habitat</li> </ul>	<ul style="list-style-type: none"> <li>▪ Cause minimum damage to the environment with construction equipment</li> <li>▪ Restrict construction activities to development footprint</li> <li>▪ Use existing roads as far as possible</li> <li>▪ Check final footprint for burrows of small mammals</li> </ul>	<ul style="list-style-type: none"> <li>▪ Kleinfontein Solar Energy Facility</li> <li>▪ Toitdale Solar Energy Facility</li> </ul>
<ul style="list-style-type: none"> <li>▪ Direct loss of vegetation</li> <li>▪ Spread of declared weeds and alien invader plants</li> <li>▪ Loss of faunal habitat</li> </ul>	<ul style="list-style-type: none"> <li>▪ Keep development impact within footprint area.</li> <li>▪ Disturbed areas should be rehabilitated as soon as possible.</li> <li>▪ Establish a monitoring programme to detect alien invasive plant species.</li> <li>▪ An active re-vegetation plan should be implemented to assist the return of natural indigenous species.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Klip Gat Solar Energy Facility</li> <li>▪ Tollie PV</li> </ul>
<ul style="list-style-type: none"> <li>▪ Alteration of vegetation cover</li> <li>▪ Erosion</li> <li>▪ Disruption of ethology of species</li> </ul>	No specific measures proposed, habitat considered to be of low value.	Nine Scatec sites

Impact	Mitigation measures	Project
<ul style="list-style-type: none"> <li>▪ Loss of individuals of species of concern</li> <li>▪ Loss of habitat / indigenous natural vegetation</li> <li>▪ Impacts on ecosystem function</li> </ul>	<ul style="list-style-type: none"> <li>▪ Contain impacts to within footprint of infrastructure</li> <li>▪ Implement measures to minimise erosion</li> <li>▪ Implement a storm-water management plan</li> <li>▪ Limit disturbance to vegetation surrounding infrastructure</li> <li>▪ Rehabilitate disturbed areas as quickly as possible</li> <li>▪ Avoid translocating soil stockpiles from areas containing alien plants</li> <li>▪ Control alien plants</li> <li>▪ Establish a monitoring programme to detect and control alien plants</li> </ul>	Middelburg Solar Park
<ul style="list-style-type: none"> <li>▪ Direct loss of vegetation</li> <li>▪ Disturbance to vegetation and associated habitats</li> <li>▪ Spread of declared weeds and alien invasive species</li> </ul>	<ul style="list-style-type: none"> <li>▪ Search and Rescue all translocatable indigenous plants</li> <li>▪ Prevent contamination by oil, diesel and other contaminants</li> <li>▪ Mitigate disturbance or loss of natural vegetation</li> <li>▪ Control declared weeds and alien invasive plants</li> <li>▪ Mitigate loss of fauna</li> <li>▪ Prevent damage to drainage systems</li> <li>▪ Minimise soil degradation and erosion</li> </ul>	Naauwpoort Solar Energy Facility
<ul style="list-style-type: none"> <li>▪ Loss of natural vegetation</li> <li>▪ Loss of habitat for red data and general species</li> <li>▪ Loss of species richness</li> <li>▪ Edge effects</li> <li>▪ Erosion</li> <li>▪ Introduction of exotic species</li> <li>▪ Loss of habitat for fauna</li> </ul>	<ul style="list-style-type: none"> <li>▪ Maintain footprint strictly during construction</li> <li>▪ Conduct walk-through survey prior to construction to conduct a search and rescue</li> <li>▪ Retain indigenous vegetation, where possible</li> <li>▪ Demarcate sensitive areas prior to construction</li> <li>▪ Vegetation to be removed only when necessary</li> <li>▪ No vegetation to be used for firewood</li> <li>▪ Implement a programme of weed control</li> <li>▪ Grass soil stockpiles to prevent weed invasion</li> <li>▪ Avoid emergence of alien invasive species</li> <li>▪ Use existing access roads</li> <li>▪ Compile a rehabilitation plan</li> <li>▪ Revegetate any disturbed areas as a priority to avoid erosion</li> <li>▪ Put in place suitable stormwater / wind controls until rehabilitation is completed</li> </ul>	Noupoort Wind Farm
<ul style="list-style-type: none"> <li>▪ Faunal habitat loss</li> <li>▪ Loss of vegetation and listed/protected plant species</li> <li>▪ Impacts on fauna</li> </ul>	<ul style="list-style-type: none"> <li>▪ Avoid placement of infrastructure within High sensitivity areas and drainage lines</li> <li>▪ Preconstruction walk-through of approved development footprint</li> <li>▪ Rehabilitate disturbed areas, for example laydown areas, after use</li> <li>▪ Minimise development footprint</li> <li>▪ Rehabilitate disturbed areas that are no longer required by the operational phase of the development</li> <li>▪ Exact routing of roads should be adjusted to avoid sensitive habitats</li> <li>▪ Preconstruction environmental induction for all construction staff</li> <li>▪ Demarcate sensitive areas in close proximity to the development footprint as no-go areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ Phezukomoya Wind Energy Facility</li> <li>▪ San Kraal Wind Farm</li> </ul>

Impact	Mitigation measures	Project
	<ul style="list-style-type: none"> <li>▪ During construction, any fauna directly threatened by construction activities should be removed to a safe location</li> <li>▪ Illegal collection, hunting or harvesting should be strictly forbidden</li> <li>▪ No fires in open veld</li> <li>▪ No fuel wood collection on site</li> <li>▪ No dogs or cats should be allowed on site</li> <li>▪ Control type, nature and timing of night-time lighting</li> <li>▪ Store all hazardous materials in an appropriate manner</li> <li>▪ No unauthorised persons to be allowed on-site and implement site access control</li> <li>▪ Enforce speed limits</li> <li>▪ If electric fencing is required anywhere, this should be designed to minimise impacts on fauna</li> <li>▪ Manage erosion according to an Erosion Management Plan and Rehabilitation Plan</li> <li>▪ All roads and hardened surfaces should have runoff control features</li> <li>▪ Regular monitoring of erosion</li> <li>▪ All cleared areas should be revegetated with indigenous species from the local area</li> <li>▪ Wherever excavation is necessary, topsoil should be set aside and replaced after construction</li> <li>▪ Implement a long-term alien plant management plan</li> <li>▪ Regular monitoring for alien plants within the development footprint as well as surrounding areas</li> <li>▪ Undertake regular clearing of alien plants using best-practice methods for the species concerned</li> <li>▪ No excavated holes or trenches should be left open for extended periods</li> <li>▪ Regular monitoring for at least two years after decommissioning to ensure that no erosion problems develop</li> <li>▪ All erosion problems observed should be rectified as soon as possible using appropriate erosion control methods</li> </ul>	

Note that none of the projects recorded threatened plant species or protected trees.

### 7.3.1.1 Description of Cumulative Impacts

There are various cumulative impacts that may occur as a result of the combined impact of a number of similar projects in the area, as follows:

1. Loss and/or fragmentation of indigenous natural vegetation due to clearing;

2. Loss of individuals of plant species of conservation concern and/or protected plants;
3. Changes to ecological processes at a landscape level;
4. Mortality, displacement and/or disturbance of fauna;
5. General increase in the spread and invasion of new habitats by alien invasive plant species;
6. Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape; and
7. Positive cumulative impact on climate change.

#### **Cumulative impacts on indigenous natural vegetation**

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

#### **Cumulative impacts on plant species of concern and protected plant species**

There are no plant species of conservation concern for the site, but there are various protected plant species that may occur in the study area, all of which are relatively widespread. Constructing the current project increases the likelihood of individuals being affected, but unless large numbers of individuals are directly affected, there will only be small cumulative effects.

#### **Cumulative impacts on ecological processes**

There are various ecological processes that may be affected at a landscape level by the presence of multiple projects. This includes obvious processes, such as migration, pollination and dispersal, but also more difficult to interpret factors, such as spatial heterogeneity, community composition and environmental gradients, that can become disrupted when landscapes are disturbed at a high level. Disturbance can alter the pattern of variation in the structure or function of ecosystems. Fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. An important consequence of repeated, random clearing is that contiguous cover can break down into isolated patches. This happens when the area cleared exceed a critical level and landscapes start to become disconnected. Spatially heterogeneous patterns can be interpreted as individualistic responses to environmental gradients and lead to natural patterns in the landscape. Disrupting gradients and creating disturbance edges across wide areas is very disruptive of natural processes and will lead to fundamental changes in ecosystem function. It is possible that this could be a cumulative consequence of the combined projects, but it is difficult to determine without a detailed assessment of fragmentation of the combination of all the projects.

### **Cumulative impacts on fauna**

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the area. This effect will be increased if there are a number of projects being constructed at the same time or in quick succession, so the effect is likely to be cumulative. However, the geographical ranges of the species of concern is wide and it is considered that the significance of the effect will be low in the long-term, although probably significant during the combined construction phase of the projects. It is possible that some species will be more significantly negatively affected than others, especially shy species, territorial species that get displaced, or those with large territories that get shrunk. It is also possible that some species will benefit from the increased presence of humans and will migrate into the area. This will possibly cause additional shifts in other species that are affected by the increase in numbers or new species.

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

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

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

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

### **Cumulative impacts on CBAs and conservation planning**

Significant proportions of the site and surrounding sites are included in Critical Biodiversity Areas for the Northern Cape. Disruption of these areas means that conservation planners have to find alternative sites to include in future CBAs according to an algorithm that seeks a least-cost outcome for preserving biodiversity, i.e. the least amount of land space for preserving the greatest amount of area of biodiversity importance, as well as meeting specific conservation targets. At some point, the loss of suitable sites leads to a situation where it is no longer possible to plan effective conservation networks or the cost of doing so increases due to a lack of choice. The higher the density of similar projects in a uniform area, the less chance there is of finding sites suitable for conservation that contain all the attributes that are desired to be conserved, including both ecological processes and ecological patterns.

### **Cumulative impact on climate change**

One of the primary reasons for promoting renewable energy projects is the desire to make South Africa compliant with international treaties regarding climate-change effects. The combined generation capacity of all the renewable energy projects considered here is just less than 1 600 MW, which is more than half of the average size of one of the 14 coal power stations in South Africa (Eskom's Generation

Division has 14 coal-fired power stations with an installed capacity of 38 548 MW, [www.eskom.co.za](http://www.eskom.co.za). A reduction in reliance on coal power would improve the air quality of the Mpumalanga Highveld (where many of these power stations are located), reduce the amount of coal-mining that would take place (which has a devastating effect on biodiversity resources and water quality) and would reduce the per capita carbon footprint of our country. Greater uptake of renewable energy would furthermore reduce the global risk of climate change, one of the factors taken into account in designing the conservation network in South Africa. The construction of renewable energy projects can be viewed as an offset for other carbon-generating technology.

#### 7.3.1.2 Assessment of Cumulative Impacts

Based on the assessment undertaken (refer to **Table 27** on **page 232**), all cumulative impacts can be reduced to a LOW significance with mitigation measures, with the exception of “*Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape*”, which has a residual significance of MEDIUM. Based on this assessment, it is considered that the cumulative impacts are acceptable.

#### 7.3.2 Avifauna

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects therefore needs to consider all renewable energy developments (wind and solar) within at least a 35km radius of the proposed site. The seventeen (17) renewable energy developments which are planned or authorised are listed in **Table 28** and displayed in **Figure 50**. Appendix 4 of the Avifaunal Specialist Study Report (**Appendix 6B**) lists the renewable energy developments together with the relevant recommended mitigation measures pertaining to birds.

##### 7.3.2.1 PV Sites

In the case of solar projects, the potentially most significant impact from an avifaunal perspective is the transformation of the natural habitat. The total land parcel area taken up by existing and proposed solar energy projects are approximately 13 000ha, and the wind energy projects come to approximately 47 000ha. The Umsobomvu SEF's will add another approximately 13 500ha of land parcel to these. The total area of the 35km radius around the proposed developments equates to about 400 000ha. The total combined size of the land parcels taken up by SEF's and WEF's, including the Umsobomvu developments, equates to about 60 500ha, which is just over 15% of the available land in the 35km radius. However, the actual footprint of the solar facilities will be much smaller than the land parcel area, between 20 - 40% of the land parcel area. In the case of the WEF's the situation is much the same. The total area to be taken up by renewable energy developments will therefore comprise less than 10% of the land surface within the 35km radius around the proposed Wonderheuveld development. The cumulative impact of the habitat transformation which will come about as a result of the proposed Wonderheuveld development should therefore be **low**.

### 7.3.3 Surface Water

Cumulative impacts are hard to predict even with knowledge of other sites in the general area that are also going to be developed. A single solar energy facility has little impact beyond the borders of the site, however, when several solar energy facilities are developed in an area, there is potentially a large cumulative impact. Negative impacts linked to roads are frequently cited as one (1) of the major effects of renewable energy developments on watercourses and water resources. These impacts include increased hardened surfaces, erosion, and direct loss of watercourse habitat. However, given the semi-arid to arid system that the proposed development will impact upon it is unlikely that large-scale impacts will be impacted by the construction of the solar energy facility on the site, and the cumulative impact of the other developments in the area on water resources is likely to still pose a low risk to these systems if correct mitigation measures are implemented. Most of the drainage of the site does not join that were found on the sites to the south of the study area, and thus the effects of the neighbouring land parcels being developed will have little impact on the study area drainage. There are however a few developments to the east and north of the site that also drain towards the Klein-Seekoei River but correct use of mitigation measures within the Wonderheuveld site will ensure that the cumulative impact will have minimal impact on the other sites in the area. Thus, no immediate cumulative impact to the drainage patterns of the site are predicted.

On a larger scale, all the drainage of the sites enters the Klein-Seekoei River which flows into the Orange River away from site. Thus, if the sites to the north cause a hydrological impact, and the Wonderheuveld site causes a hydrological impact, these impacts (increased run-off as well as associated erosion and sedimentation impacts) will eventually meet in the Seekoei River and exacerbate each other. However, the risk of either site causing a significant impact is small if all appropriate mitigation (as contained in **Table 27** above) that has been proposed is implemented.

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMP Reports) for the surrounding developments. However, many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments were considered as part of the cumulative impact assessment.

### 7.3.4 Agriculture and Soils

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss or degradation of agricultural land. The defining question for assessing the cumulative agricultural impact is this:

*'What level of loss of agricultural land-use is acceptable in the area, and will the loss associated with the Umsobomvu PV development, cause that level in the area to be exceeded?'*

The DEFF requires compliance with a specified methodology for the assessment of cumulative impacts. This is positive in that it ensures engagement with the important issue of cumulative impacts. However, the required compliance has some limitations and can, in the specialist's opinion, result in an over-focus on methodological compliance, while missing the more important task of answering the above-defining question more broadly.

The first limitation with the DEFF's required methodology is that it restricts the cumulative impacts to similar developments, so in this case to renewable energy developments. In order to accurately answer the defining question above, all developments, regardless of their type and similarity, should be taken into account, because all will contribute to exceeding the acceptable level of change.

The second problem with the requirement, is that it restricts surrounding developments to those within an absolutely defined distance, in this case 35km. Again, this does not allow for accurately answering the defining question. To achieve this, the distance used for cumulative impact assessment should be discipline dependent. A different distance is likely to apply for agricultural impact than for economic impact or botanical impact. And a different distance should be used in different environments, for example in high potential agricultural environments versus very low potential agricultural environments.

Given the above, this assessment focuses less on methodological compliance and more on effectively addressing the defining question above by considering the cumulative impacts more broadly than is required by DEFF compliance. This includes considering a wider area than the 35km radius and considering the likelihood of pressure from other types of developments as well.

There are seventeen (17) renewable energy developments, with their associated transmission lines, within 35km of the proposed site (that need to be considered in terms of the DEFF requirements). These are listed in **Table 28** and mapped in **Figure 50**.

All of these projects have the same agricultural impacts in a very similar agricultural environment, and in all cases the agricultural impact is assessed as low.

Of all the mitigation measures proposed for all of these developments, the following have not been included in the Agricultural and Soils Impact Assessment Report (**Appendix 6A**) for the reasons given. All others have been included.

- Keeping disturbed soil covered by straw, mulch, or erosion control mats. This is not considered viable in the arid environment. Straw would blow away, and there is unlikely to be any viable source of mulch. Vegetation establishment, taking into account any recommendations by the vegetation study, would be the most viable form of soil stabilisation.



In quantifying the cumulative impact, the area of land taken out of agricultural grazing as a result of all of the developments above will amount to a total of approximately 1,700ha. This is calculated using the industry standards of 2.5 and 0.3ha per MW for solar and wind energy generation respectively, as per the DEFF (2015). As a proportion of the area within a 35km radius (approximately 385,000ha), this amounts to only 0.44% of the surface area. That is well within an acceptable limit in terms of loss of low potential agricultural land, of which there is no scarcity in the country. This is particularly so when considered within the context of the following point:

- For South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are therefore far higher in this region than in regions with higher agricultural potential.

It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land-use in this area. The cumulative impact from developments, other than renewable energy, is therefore low.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land-use is assessed as having low significance. In terms of cumulative impact, therefore, the development can be authorised.

### 7.3.5 Visual

Although it is important to assess the visual impacts of the proposed solar PV facility specifically, it is equally important to assess the cumulative visual impact that could materialise if other renewable energy facility (both wind and solar facilities) and associated infrastructure developments are developed in the broader area. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include renewable energy facilities and associated infrastructure development.

Renewable energy facilities have the potential to cause large-scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. Although power lines and substations are relatively small developments when compared to renewable energy facilities, they may still introduce a more industrial character into the landscape, thus altering the sense of place.

Seventeen (17) renewable energy projects were identified within a 35km radius of the proposed solar PV facility (**Figure 50**). These projects, as listed in **Table 28**, were identified using the DEFF's Renewable Energy EIA Application Database for SA in conjunction with information provided by IPPs operating in the broader region. It is assumed that all of these renewable energy developments include

grid connection infrastructure, although few details of this infrastructure were available at the time of writing this report.

The relatively large number of renewable energy facilities within the surrounding area and their potential for large-scale visual impacts could significantly alter the sense of place and visual character in the broader region, as well as exacerbate the visual impacts on surrounding visual receptors, once constructed.

As can be seen from **Table 28**, thirteen (13) of these projects are Solar Energy facilities (SEFs), most of which are located more than 10km from the application site, clustered on the western edge of Noupoort and also to the north of Main Road 389 and along an existing rail route. Given the distance from the study area and the concentration of these facilities in close proximity to existing built infrastructure, it is not anticipated that these developments will result in any significant cumulative impacts affecting the landscape or the visual receptors within the combined assessment zone. It should be noted that although all of these SEF applications were approved at least five (5) years ago, to date only one (1) has been constructed.

The remaining four (4) developments are wind energy facilities (WEFs), all of which are located on the hillier terrain to the east of the solar PV application site. Although WEFs are expected to have different impacts when compared to solar PV developments, these renewable energy developments are however relevant as they influence the cumulative visual impact of the proposed development.

The proposed San Kraal WEF is located well outside the combined visual assessment zone, just east of the N9 national route, while only a small portion of the Phezukomoya WEF, which is located immediately west of the N9, is located within 5km of the proposed solar PV facility. As such, these WEFs are not expected to give rise to any significant cumulative impacts on the landscape or visual receptors within the study area.

The remaining WEF, namely Umsobomvu WEF, is however almost entirely within 5km of the proposed solar PV facility, and is in fact adjacent to sections of the application site. It is understood that most of the proposed turbines on the WEF development site will be located on high-lying plateaus and ridges and as such they will be visible to many of the visual receptors in the combined assessment area.

This proposed WEF, in conjunction with the proposed solar PV facility and associated grid connection infrastructure, will inevitably introduce an increasingly industrial character into a largely natural, pastoral landscape, thus giving rise to significant cumulative impacts.

It should be noted however that PV panels, at an approximate height of 4m, are considerably less visible than wind turbines and as such the proposed solar PV facility would be outside the viewshed of many of the potentially sensitive receptor locations identified in the study area. Cumulative impacts affecting these receptors would therefore be reduced and the severity of these impacts would depend on the perceptions of the receptors.

A cursory examination of the literature available for the environmental assessments undertaken for many of these renewable energy applications showed that the visual impacts identified, and the recommendations and mitigation measures provided are largely consistent with those identified in the

VIA Report. Where additional mitigation measures were provided in respect of the other renewable energy applications, these have been incorporated into the VIA Report where relevant.

From a visual perspective, the further concentration of renewable energy facilities as proposed will inevitably change the visual character of the area and alter the inherent sense of place, introducing an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures put forward by the visual specialists in their respective reports.

### 7.3.6 Heritage

The cumulative impacts on heritage resources evaluated a 35km radius (**Figure 50**). It must further be noted that the evaluation is based on available heritage studies (**Table 30**) and cannot take the findings of outstanding studies on current on-going EIA's in consideration.

The following must be considered in the analysis of the cumulative effect of development on heritage resources:

- **Fixed datum or dataset:** There is no comprehensive heritage data set for the region and thus we cannot quantify how much of a specific cultural heritage element is present in the region. The region has never been covered by a heritage resources study that can account for all heritage resources. Further to this none of the heritage studies conducted can with certainty state that all heritage resources within the study area has been identified and evaluated;
- **Defined thresholds:** The value judgement on the significance of a heritage site will vary from individual to individual and between interest groups. Thus, implicating that heritage resources' significance can and does change over time. And so, will the tipping threshold for impacts on a certain type of heritage resource; and
- **Threshold crossing:** In the absence of a comprehensive dataset or heritage inventory of the entire region we will never be able to quantify or set a threshold to determine at what stage the impact from developments on heritage resources has reached or is reaching the danger level or excludes the new development on this basis. (Godwin, 2011).

Keeping the above shortcomings in mind, the methodology in evaluating cumulative impacts on heritage resources has been as follows.

The analysis of the completed studies as listed in **Table 30**, took in to account the findings and recommendation of each of the seventeen (17) evaluated HIA's. The cumulative impact on the cultural landscape was discounted as the HIA's, in most cases, did not address this and the Visual Impact Assessment covers such analysis in detail.

The overall findings of the seventeen (17) studies all concur that the area is characterised by numerous Stone Age findspots and archaeological resources. Many these concentrated around outcrops in a landscape where water, food and shelter came at a premium. The sites around the outcrops where in most cases given a medium to high heritage significance on a local scale and in the majority of the cases were recommended as being 'no-go' areas or extensive mitigation is required.

This cumulative assessment has also not addressed the possible cumulative impacts on the heritage landscape. The evaluated studies have in most cases not addressed or quantified the possible impact on the cultural landscape.

**Table 30** below provide an analysis of the projected cumulative impact this proposed development will add to impact on heritage resources.

The significance of the cumulative impacts is assessed in **Table 27** on **page 232**. The projected impact significance for the proposed development on heritage resources is MEDIUM before mitigation and management and will reduce to LOW.

**Table 30:** Heritage Impact Assessments conducted within 35km from the Wonderheuveld PV Project

Project	DEFF Reference No	Findings	Recommendations
Allemands Fontein SEF	14/12/16/3/3/1/730	Surface scatters of middle stone age artefacts occurred over the extent of the area. Most were however disturbed and of low heritage value. Although the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Carolus Poort SEF	14/12/16/3/3/1/729	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. Most were however disturbed and of low heritage value. Although the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Damfontein SEF	14/12/16/3/3/1/728	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. Most were however disturbed and of low heritage value.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Gillmer SEF	14/12/16/3/3/1/735	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. One (1) single collapsed stone structure was discovered. Most were however disturbed and of low heritage value. Although the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Inkululeko SEF	14/12/16/3/3/1/553	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Kleinfontein SEF	12/12/20/2654	Surface scatters of middle stone age artefacts occurred over the extent of the area.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Klip Gat SEF	14/12/16/3/3/2/354	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. One (1) single collapsed stone structure was discovered. One (1) area of high significance was demarcated. Although	General management measures such as informing SAHRA and chance finds procedure to be put in

Project	DEFF Reference No	Findings	Recommendations
		the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	place. A detailed survey of the demarcated area was recommended.
Linde SEF	12/12/20/2258	One (1) site was identified with a cultural heritage resource, a stone redoubt emanating from the Second Boer War together with a portion of low gauge railway line. The resource has been excluded from the development footprint on-site H, Taaibos.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering of the site was recommended.
Linde SEF (Expansion)	14/12/16/3/3/1/1122	One (1) site was identified with a cultural heritage resource, a stone redoubt emanating from the Second Boer War together with a portion of low gauge railway line. The resource has been excluded from the development footprint on-site H, Taaibos.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering of the site was recommended.
Middelburg Solar Park 1	12/12/20/2465/2	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. A few stone outcrops showed higher concentrations of lithics and required buffering.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.
Middelburg Solar Park 2	12/12/20/2465/1	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. A few stone outcrops showed higher concentrations of lithics and required buffering.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was

Project	DEFF Reference No	Findings	Recommendations
			recommended. Buffering some sites were recommended.
Naauw Poort SEF	14/12/16/3/3/2/355	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. A few dry pack stone walls were identified as having a medium heritage significance. One (1) area of high significance was demarcated. Various fossil finds were made in the Katberg formation during fieldwork.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Further ground-truthing of footprint areas were recommended.
Toitdale SEF	12/12/20/2653	Surface scatters of middle stone age artefacts occurred over the extent of the area.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Noupoort Wind Farm	12/12/20/2319	A rock shelter with rock art was identified. Numerous dry-stone walled enclosures were identified. A farmstead and cemetery were also identified during the fieldwork. Various fossil finds were made in the Katberg formation during fieldwork.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Further ground-truthing of footprint areas were recommended
Phezukomoya WEF	14/12/16/3/3/1/1028	Stone Age archaeological sites are sparse in the high suurveld areas and that not very many sites will be physically impacted. Two (2) archaeological sites will require mitigation through avoidance or alternatively systematic collection. Only a few fossil remains were recorded during a four-day field assessment	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.

Project	DEFF Reference No	Findings	Recommendations
San Kraal WEF	14/12/16/3/3/1/1069	The comprehensive survey of the project area, associated infrastructure and power lines has revealed that Stone Age archaeological sites are sparse in the high suurveld areas and that not very many sites will be physically impacted. Fossil finds on-site are confined to mostly fragmented river-washed bone fragments. The presence of a number of fossilised vertebrate burrows in a riverbed was also noted	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.
Umsobomvu WEF	14/12/16/3/3/2/730	A total of 41 heritage sites were noted in the study area from in the desktop and field survey. These sites varied from open stone tool scatters, rock art sites in small overhangs, and built structures such as farm buildings and kraals. The historical buildings were the most frequently occurring heritage sites. Three (3) of these early farmsteads have associated cemeteries. There are no fatal flaws in the Umsobomvu WEF development proposal as far as fossil heritage is concerned.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.



### 7.3.7 Palaeontology

A total of seventeen (17) Renewable Energy Facilities (13 Solar Energy Facilities and 3 Wind Energy Facilities) are present in a 35km radius of the proposed solar PV energy facility. Thirteen (13) of these facilities have been approved while two (2) facilities are operational and two (2) are in and EIA Process (**Table 28**).

It was difficult to obtain all the relevant Palaeontological Impact Assessments from the internet except the following:

- ALMOND, J. E., 2017. Palaeontological Impact Assessment of the proposed Phezukomoya wind farm near Noupoot, Northern and Eastern Cape.
- BUTLER, E. 2016. Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoot, Northern Cape.
- GESS, R. 2012. Proposed construction of a Photovoltaic Power station and associated infrastructure at Collett substation near Middelburg in the Eastern Cape. Palaeontological Impact Assessment Report.
- ORTON, J., ALMOND, J., CLARKE, N., FISHER, R., HALL, S., KRAMER, P., MALAN, A., MAGUIRE, J. AND JANSEN, L. 2016. IMPACTS ON HERITAGE. IN SCHOLLES, R., LOCHNER, P., SCHREINER, G., SNYMAN- VAN DER WALT, L. AND DE JAGER, M. (EDS.). 2016. Shale Gas Development in the Central Karoo: A Scientific Assessment of the Opportunities and Risks. CSIR/IU/021MH/EXP/2016/003/A, ISBN 978-0-7988-5631-7, Pretoria: CSIR. Available at <http://seasgd.csir.co.za/scientific-assessmentchapters/>.

**Table 31** below provides the findings and recommendations from the other specialist studies / assessments which were reviewed.

**Table 31:** Findings and Recommendations from other Specialist Studies / Assessments

<b>Project</b>	<b>Findings</b>	<b>Recommendations</b>
Allemans Fontein SEF	Mudstones and sandstones and dolerite	No fossils observed, No special recommendations Proceed with Project
Carolus Poort SEF	Katberg and Balfour Formations present, dolerite	No fossils observed, No special recommendations Proceed with Project
Damfontein SEF	Mudstones and sandstones and dolerite	Pre-construction site visit
Gillmer SEF	Mudstones and sandstones and dolerite	No fossils observed, No special recommendations Proceed with Project
Inkululeko SEF	-	-
Kleinfontein SEF	-	-
Klip Gat SEF	Adelaide Subgroup and dolerite	Pre-construction site visit
Linde SEF	-	-
Linde SEF (Expansion)	-	-
Middelburg Solar Park 1	Katberg and Balfour Formations, dolerite and Quaternary	Pre-construction site visit
Middelburg Solar Park 2	Katberg and Balfour Formations, dolerite and Quaternary	Pre-construction site visit
Naauw Poort SEF	Katberg Formation	Pre-construction site visit
Toitdale SEF	-	-
Noupoort Wind Farm	Katberg Formation, dolerite and Quaternary	No site visits pending discovery of fossils
Phezukomoya WEF	Katberg and Balfour Formations present; fragmentary bones vertebrate burrows,	Buffer, mitigation
San Kraal WEF	Katberg and Balfour Formations present;	Buffer, mitigation
Umsobomvu WEF	-	-

### 7.3.8 Social

Renewable energy facilities require specific climatic conditions that provide high levels of solar radiation and wind energy. This has resulted in a tendency for these facilities to be clustered in specific areas, such as the Karoo, that provide these ideal conditions. Consequently, this grouping of facilities in specific areas has in turn led to cumulative impacts. In this regard the following developments, illustrated in the map in **Figure 50**, have been identified within a 35km radius of the proposed Wonderheuveld Solar PV Energy Facility:

- Allemans Fontein SEF;
- Carolus Poort SEF;
- Damfontein SEF;
- Gillmer SEF;
- Inkululeko SEF
- Kleinfontein SEF;
- Klip Gat SEF;
- Linde SEF;
- Middelburg Solar Park 1;
- Middelburg Solar Park 2;
- Naauw Poort SEF;
- Toitdale SEF;
- Noupoot Wind Farm;
- Phezukomoya WEF;
- San Kraal WEF;
- Umsobomvu WEF; and
- Linde SEF (Expansion).

#### 7.3.8.1 Review of Specialist Reports for Renewable Energy Facilities in the Area

The following more specific social issues have been raised in the specialist reports pertaining to the various renewable energy initiatives identified above.

- **Positive impacts**
  - Job creation; Impacts associated with the construction phase are generally short-term
  - Establishment of local community trust
  - Establishment of renewable energy infrastructure
- **Negative impacts**
  - Sense of place
  - Influx of construction workers
  - Impact on family and community relations – STDs and HIV
  - Risk of stock theft, poaching and damage to farm infrastructure
  - Risk of veld fires
  - Impact of heavy vehicles, damage to roads, safety, noise and dust

- Loss of agricultural land
- Impact on tourism
- **Indirect Impacts**
  - After construction locals may not find future employment
  - Skills and development – increased employability
- **Cumulative Impacts**
  - Development of additional renewable energy facilities – increased potential for job creation
  - Impact on family and community relations – STDs and HIV
  - Sense of place
  - Pressure on municipal and social services
- **No-Go option**
  - Loss of renewable energy infrastructure
  - High carbon emissions
  - Unsustainable way to produce electricity
  - Overall social impact
  - Predominantly low significance (positive impact)
  - In respect of climate change – a positive social benefit for society as a whole.

The details of the reports from which these impacts have been sourced are provided in **Table 32** below.

**Table 32:** List of EIA reports for developments within a 35km radius

Date	Title of report	DEFF Ref number	Consultant responsible for report	Page numbers
July 2011	Establishment of Photovoltaic (Solar Power) Farms in the Northern Cape	12/12/20/2258	Sustainable Development Projects cc	4-5, 37-39, 51
February 2012	Environmental Basic Impact Assessment Process Draft Basic Assessment Report, Proposed Toitdale Solar Energy Facility Northern Cape Province	12/12/20/2653	Savannah Environmental (Pty) Ltd	47, 58, 61-62
March 2012	Social Impact Assessment Aced Middleburg Photovoltaic Solar Energy Facility Eastern Cape Province	Specialist report	Tony Barbour Environmental Consulting and Research	Entire report
March 2012	Environmental Basic Impact Assessment Process Draft Basic Assessment Report, Proposed Middelburg Solar Park 1 Eastern Cape Province	12/12/20/2465/2	Savannah Environmental (Pty) Ltd	54-63, 71-73
13 April 2012	Mainstream Renewable Power South Africa Noupoort (Pty) Ltd. Proposed Construction of a Wind Farm near Noupoort, Northern Cape Province, South Africa. Final Environmental Impact Report	12/12/20/2319	SiVEST Environmental Division	156-177, 221-228, 232-234
May 2012	Environmental Basic Impact Assessment Process Draft Basic Assessment Report, Proposed Tollie Solar Energy Installation on a site near Noupoort, Northern Cape Province	14/12/16/3/3/1/528	Savannah Environmental (Pty) Ltd	54-59, 65-68
September 2012	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Klip Gat Solar Energy Facility (75MW) near Noupoort, Northern Cape Province	14/12/16/3/3/2/354	Savannah Environmental (Pty) Ltd	61-62, 71-72, 79
September 2012	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Naauw Poort Solar Energy Facility (75MW) near Noupoort, Northern Cape Province	14/12/16/3/3/2/355	Savannah Environmental (Pty) Ltd	84-86, 95-96, 101, 101-111
November 2012	Social Impact Assessment Klipgat Solar Energy Facility Northern Cape Province (Draft Report)	Specialist report	Tony Barbour Environmental Consulting and Research	Entire report
December 2012	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Damfontein Solar Energy Facility near Noupoort, Northern Cape Province	14/12/16/3/3/1/728	Savannah Environmental (Pty) Ltd	70-72 & 79-81

<b>Date</b>	<b>Title of report</b>	<b>DEFF Ref number</b>	<b>Consultant responsible for report</b>	<b>Page numbers</b>
January 2013	Environmental Impact Assessment Process Final Basic assessment Report, Allemans Fontein Solar Energy Facility near Noupoot, Northern Cape Province	14/12/16/3/3/1/730	Savannah Environmental (Pty) Ltd	66-67 & 80-81
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Carolus Poort Solar Energy Facility near Noupoot, Northern Cape Province	14/12/16/3/3/1/729	Savannah Environmental (Pty) Ltd	73-74
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Gillmer Solar Energy Facility near Noupoot, Northern Cape Province	14/12/16/3/3/1/735	Savannah Environmental (Pty) Ltd	74-75 & 78-79, 82-83
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Inkululeko Solar Energy Facility near Noupoot, Northern Cape Province	14/12/16/3/3/1/553	Savannah Environmental (Pty) Ltd	63, 66 & 68
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Kleinfontein Solar Energy Facility near Noupoot, Northern Cape Province	12/12/20/3//2654	Savannah Environmental (Pty) Ltd	45-46, 59, 61
April 2016	Proposed Umsobomvu Wind Energy Facility, Northern Cape & Eastern Cape Provinces	14/12/16/3/3/2/730	Savannah Environmental (Pty) Ltd	117-121, 127, 147
December 2017	Social Impact Assessment Phezukomoya Wind Energy Facility Northern Cape and Eastern Cape Province	Specialist report	Tony Barbour Environmental Consultant and Researcher	Entire report
December 2017	Social Impact Assessment San Kraal Wind Energy Facility Northern and Eastern Cape Province	Specialist report	Tony Barbour Environmental Consultant and Researcher	Entire report
March 2018	Environmental Impact Assessment Report for the Proposed 315 MW Phezukomoya Wind Energy Facility and Grid Connection, Northern and Eastern Cape Provinces	14/12/16/3/3/2/1028	Arcus Consultancy Services South Africa (Pty) Limited	ix, 329-338, 350
March 2018	Environmental Impact Assessment Report for the Proposed 390 MW San Kraal Wind Energy Facility and Grid Connection, Northern and Eastern Cape Provinces	14/12/16/3/3/2/1029	Arcus Consultancy Services South Africa (Pty) Limited	vii-viii, 328-337, 350

## **Recommendation**

Recommendations of the reports reviewed indicate that, on an overall basis, the social benefits of renewable energy developments in the area outweigh the negative benefits and that the negative social impacts can be mitigated.

In this regard the following cumulative impacts are addressed below:

- Risk of HIV;
- Sense of place;
- Service supplies and infrastructure; and
- The economic benefit.

### *7.3.8.2 Risk of HIV Infections<sup>19</sup>*

With an HIV prevalence rate of 17.5%, the Northern Cape Province has the lowest HIV prevalence rate of all provinces across South African with the Eastern Cape having the third highest rate at 31.4%. At a district level the Pixley ka Seme District Municipality has the 5<sup>th</sup> lowest HIV prevalence rate across all district municipalities in South Africa at 15.1%. In comparison, the Chris Hani district has the 14<sup>th</sup> highest HIV prevalence rate across all district municipalities with a rate of 34.5%. It is most likely that this higher prevalence rates in the Chris Hani district will be associated with more densely populated urban areas and along transport routes, considering that the Chris Hani district serves as a linking node to all regions in the Eastern Cape.

With most developments falling within what is a sparsely populated region of the Northern Cape and along the sparsely populated Northern and Eastern Cape border, HIV prevalence rates will likely be low within the immediate vicinity of these developments. Consequently, it is important to consider the risk of the spread of HIV associated with these developments, particularly where the workforce is recruited from areas that are likely to have relatively high levels of HIV such as Middelburg and other urban areas further afield. This is important as it is well documented on both an international and local basis that the construction industry carries with it a high risk of HIV (Meintjes, Bowen, & Root, 2007; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Wasie, et al., 2015; Bowen P. , Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P. , Govender, Edwards, & Lake, 2018) which can be spread amongst the local communities, particularly through an increase in prostitution that follows the availability of disposable income. It is also well documented, on both an international and local level, that HIV is also spread by truck drivers (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Strauss, *et al.*, 2018) and there is likely to be an increase in truck drivers in the area as equipment and material is delivered to the various construction sites.

These issues, associated with the area being extremely poor and the associated disposable income that will follow the construction workers and truck drivers to the area, will heighten the risk of the spread of HIV infections across what is a rather remote region. In this regard, The World Bank (2009, pp. 367-368) had indicated a strong link between infrastructure projects and health as:

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<sup>19</sup> HIV prevalence rates are at 2013 figures based on The 2013 National Antenatal Sentinel HIV Prevalence Survey, South Africa

*'Transport, mobility, and gender inequality increase the spread of HIV and AIDS, which along with other infectious diseases, follow transport and construction workers on transport networks and other infrastructure into rural areas, causing serious economic impacts.'*

#### 7.3.8.3 Transformation of Sense of Place

There is also a concern amongst various interest groups that the proliferation of renewable energy facilities in the Karoo will have a significant and negative cumulative social impact on the area's isolated, tranquil and pristine environment<sup>20</sup>. In this regard issues such as the aesthetic appearance associated with highly visible solar parks and wind farms; the noise from turbine blades; the loss of bird and bat life and its effect on tourism; as well as the disruption of social networks have all been cited amongst these concerns.

This is, however, a complex issue as there are varying opinions in respect of the aesthetic appearance of renewable energy facilities with some regarding them in a far more positive light than others (Firestone, Bidwell, Gardner, & Knapp, 2018; Schneider, Mudra, & Kozumplíková, 2018). In a study of public attitudes towards onshore wind farms in south-west Scotland, it was found that many regarded the visual impact of these developments in a positive light. It must, however, be noted that this was linked with community ownership having a positive impact on public attitudes towards wind farm developments in Scotland (Warren & McFadyen, 2010). A further and important consideration in this regard is of an ethical nature associated with community acceptance and energy justice and raises the question of the incorporation of public acceptance, particularly that of the underrepresented, into energy policy (Roddisa, Carvera, Dallimerb, Normana, & Ziva, 2018, pp. 362-363).

#### 7.3.8.4 Services, Supplies and Infrastructure

With the increase in renewable energy facilities in the area it is quite likely that the local authorities, currently hard-pressed to deliver services, will find it difficult to keep up with these developments. The influx of construction workers is likely to place pressure on accommodation and the need for both services and supplies. Noupoot, Hanover and Middelburg, being within a 35km radius of these developments, are likely to bear the brunt of the demand for accommodation, services and supplies. On this basis market demands could inflate costs which may have a negative effect on local communities, particularly the poor, who may be forced to pay higher prices for essential supplies resulting in an escalation in the cost of living in the area.

Social services such as medical and educational facilities could also be placed under pressure due to increased demand. Although this may reach its peak during the construction phase it should be

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<sup>20</sup> Amongst others see for instance:

1. Heritage South Africa's Karoo News Group <http://heritagesa.org/wp/2222-2/>
2. Alternative sources of energy for South Africa in various shades of green (Smit, 2011)
3. Social media sites such as the Facebook Karoo Energy Debate <https://www.facebook.com/TheKarooEnergyDebate/>
4. Why the Karoo (Research Chair in the Sociology of Land, Environment and Sustainable Development. Department of Sociology and Social Anthropology, Stellenbosch University, 2016)



mitigated somewhat by the fact that the construction of the various developments will be spread across different timelines, with some developments commencing while others reach completion. Employing local people across the various developments and development phases will help in reducing the stress placed on services, supplies and infrastructure in the area.

During the operational phases it is likely that these demands will continue as operational staff take up more long-term residency in the area and are supported by service and maintenance personnel who may spend some time on-site on a contractual basis. An influx of temporary maintenance and service workers is likely to last over the operational phase of the developments but is likely to settle within the medium term as the economy adjusts and the municipal authorities are able to respond to this growth.

#### *7.3.8.5 Economic Benefit*

The cumulative economic impact of the proposed development will be both positive and negative. The negative economic impacts, associated with a possible rise in living costs driven by market demand, are considered under the section above. Under this section, the positive economic impacts will be addressed.

From a positive perspective, the proliferation of renewable energy facilities within the region is likely to result in significant and positive cumulative impacts in the area associated with both direct and indirect job creation, skills development, training opportunities, and the creation of business opportunities for local businesses. The district and local municipalities within the area have identified renewable energy as a strategic economic opportunity in a region that previously had few such opportunities. This is indicated in the various IDPs and LEDs pertaining to the affected municipalities.

#### *7.3.8.6 Assessment of Cumulative Impacts*

The cumulative impacts discussed above are assessed in **Table 27** on **page 232**. It must, however, be noted that this assessment is at a superficial level as any in-depth investigation of the cumulative effects of the various developments being planned for the region are beyond the scope of this study as they would require a broad-based investigation on a far larger scale.

The assessment of the cumulative impacts takes into consideration the impacts associated with all renewable energy facilities within a 35km circumference of the Wonderheuvél Solar PV Energy Facility. On this basis no fatal flaws associated with the cumulative impacts are evident at a social level. The findings support the recommendations of the reports listed in **Table 32** that, on an overall basis, the social benefits of renewable energy developments in the area outweigh the negative benefits and that the negative social impacts can be mitigated.

### 7.3.9 Transportation

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments, however many of the documents are not currently publicly available. To this extent, the information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

The information obtained for other planned renewable energy developments in the surrounds is indicated in **Figure 50**. A number of the proposed renewable energy developments are located within a 35km radius of the solar PV energy facility development. However, for the purpose of this assessment, the specialist only assumed the two (2) developments which are in close proximity to the Wonderheuvél Solar PV Energy Facility development as it is believed they will have the greatest impact from a transportation perspective. The two (2) developments are therefore as follows:

<b>UMSOBOMVU - Wind Energy Facility (WEF)</b>	
Developer	Umsobomvu Wind Power (Pty) Ltd
Renewable Energy Type	Wind Turbine Generators
Total Development Area	18 263ha
Wind Turbine Generators	84 Turbines
Infrastructure Area	108.8ha
<b>PHEZUKOMOYA - Wind Energy Facility (WEF)</b>	
Developer	Phezukomoya Wind Power (Pty) Ltd
Renewable Energy Type	Wind Turbine Generators
Total Development Area	15 271ha
Wind Turbine Generators	63 Turbines
Infrastructure Area	74.25ha

Based on the information available, both developments have indicated that they will NOT use the Leeupoort / Noupoort intersection located on the N10 freeway at Km 19.92 on section N10-5. Therefore, the cumulative impact on the proposed access point on the N10 freeway will only be applicable to the Wonderheuvél Solar PV Energy Facility.

There will however be a cumulative impact on the background traffic between the Wonderheuvél Solar PV Energy Facility and Noupoort / Middleburg. This impact will however be difficult to simulate as the intended start dates and construction programs for each development will need to be clarified. It is

therefore recommended that this study be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.

The cumulative impacts discussed above are assessed in **Table 27** on **page 232**.

## 8 LAYOUT ALTERNATIVES

One (1) of the aims of the Scoping Report was to identify alternatives to carry through to the EIA phase of the investigation for detailed assessment (as was discussed in **section 3.3**). The selection of alternatives during the scoping phase of the proposed development helped to focus future investigations, both in terms of the environmental investigations required and the scope of the public participation process. No layout alternatives for the laydown areas and O&M buildings were identified or comparatively assessed during the scoping phase as these were informed by the identified environmental sensitive areas. During the scoping phase the preliminary PV development area was comparatively assessed with the proposed PV development area, which was informed by the identified sensitive areas. The proposed PV development area was then used to inform the location of the layout alternatives, which have been presented and assessed in the EIA phase. The layout alternatives which have been presented and assessed in the EIA phase include location alternatives for laydown / staging areas and O&M buildings.

Various environmental specialists assessed the site during the scoping phase. Their assessments focussed on the entire application site and also included the identification of sensitive areas. Based on the specialist assessments which were conducted, a few potentially sensitive areas have been identified within the application site. These sensitive areas were subsequently used during the scoping phase to inform the area for the potential erection of PV modules within the application site (referred to as the PV development area<sup>21</sup>). The identified sensitive areas were precluded from the proposed PV development area. These include the Terrestrial Ecologist, Palaeontologist, Surface Water, Heritage and Agricultural Specialists. In addition, the proposed PV development area that was presented in the DSR and FSR was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure alternatives which have been investigated and assessed in the EIA phase. The sensitive areas also informed the assessment of layout alternatives which have been further assessed during the EIA phase. As mentioned, the layout alternatives which were identified and assessed during the EIA phase include location alternatives for laydown / staging areas and O&M buildings.

It should be noted that the layout alternatives for the EIA phase were based on both environmental constraints and design factors. The findings of the specialist studies and sensitivity mapping were used to inform the layout of the proposed facility within the preferred site during the EIA phase.

As part of the EIA, the layout for the proposed solar PV energy facility and associated infrastructure has aimed to avoid the sensitive features identified by the specialists.

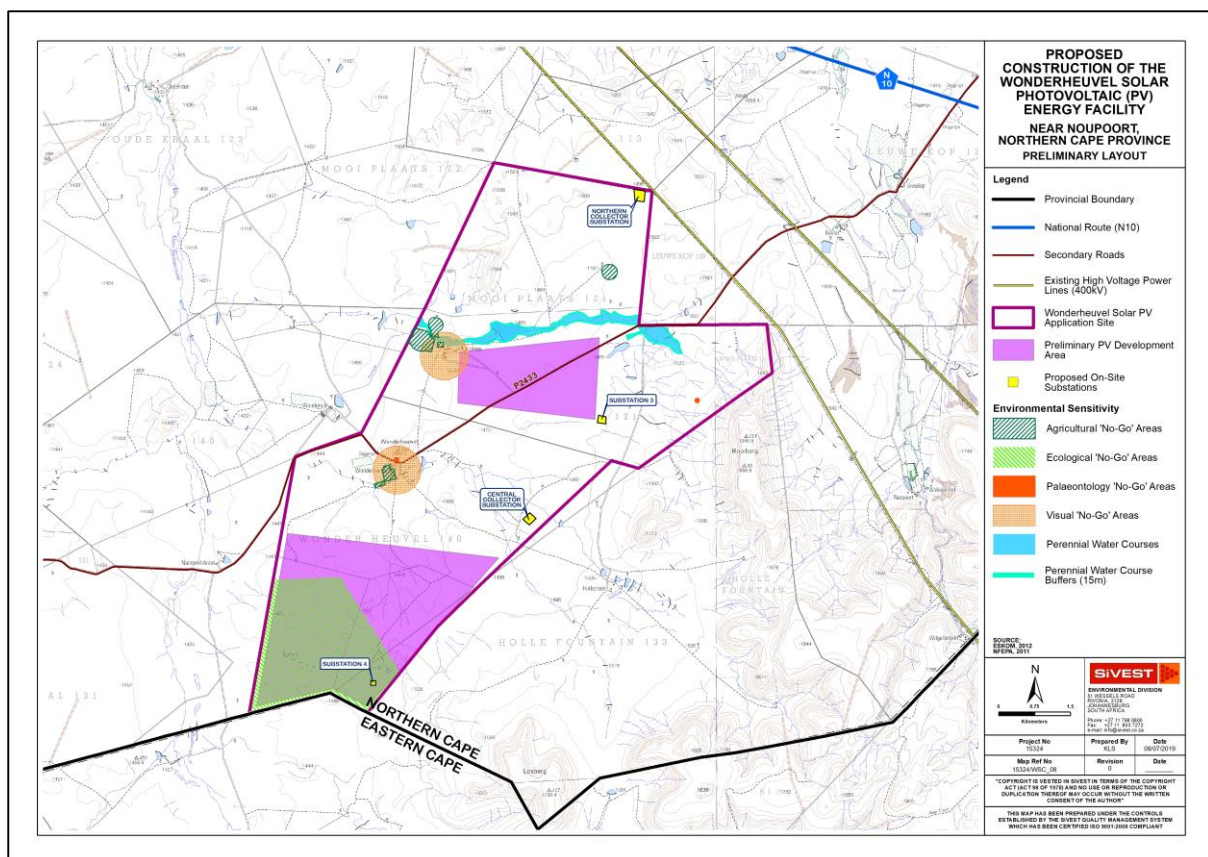
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<sup>21</sup> PV modules will not necessarily be erected in the entire proposed PV array areas, particularly where PV modules cannot be placed (e.g. under the existing 400kV transmission lines)

## 8.1 Assessment of PV Development Areas

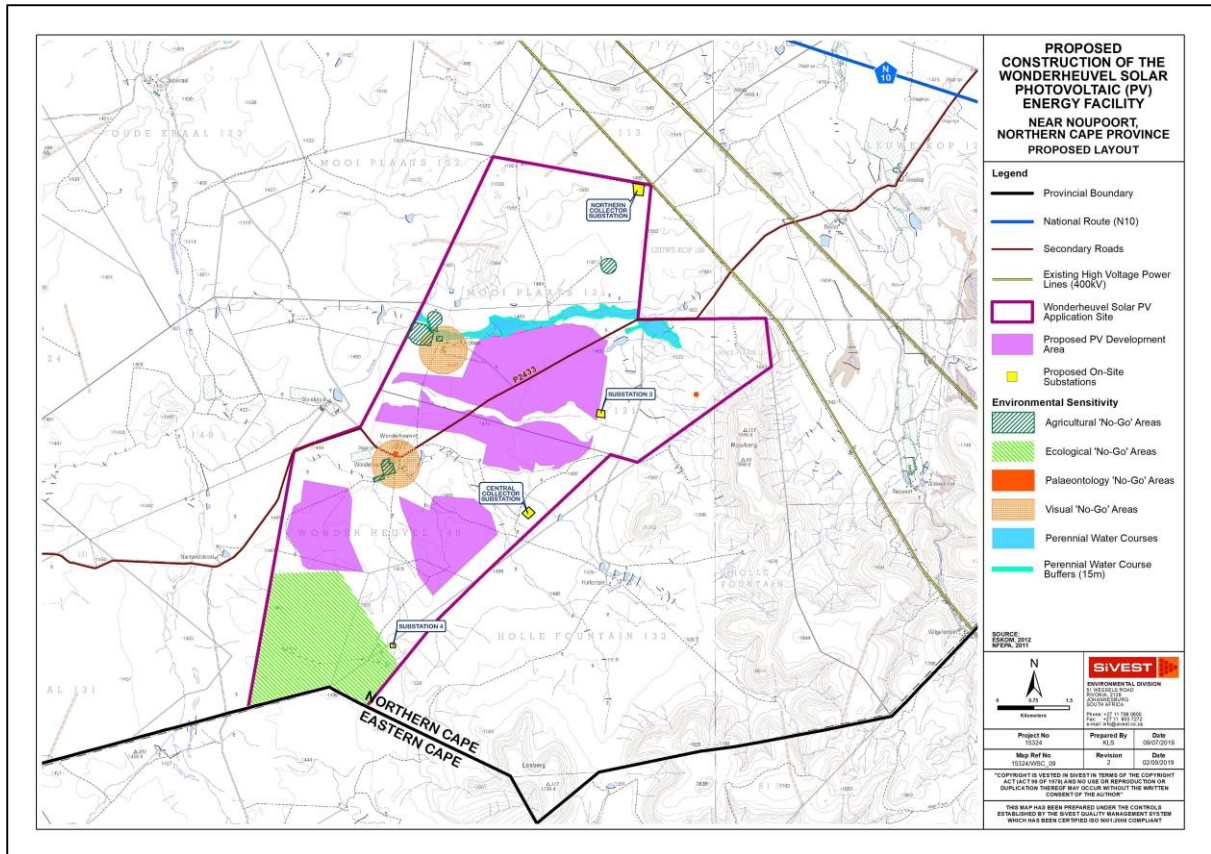
It should be noted that prior to the submission of the DSR, a preliminary PV development area (**Figure 51**) was considered by the applicant. However, in order to ensure that the proposed development avoids the sensitive areas identified by the specialists, the preliminary PV development area was subsequently amended. In addition, the PV development area was further refined following the submission of the DSR and prior to the submission of the FSR. The refined proposed PV development area which was presented in the scoping phase (namely in the FSR) is presented in **Figure 52**. During the scoping phase the preliminary PV development area was comparatively assessed with the PV development area (**Figure 52**), which was informed by the identified sensitive areas and presented in the scoping phase (namely the 'proposed PV development area'), in order to assess and confirm if the proposed development area would be 'preferred' from an environmental perspective. A comparative assessment of the preliminary PV development area with the proposed PV development area which was presented in the FSR is thus provided in this section.

A map showing the preliminary PV development area in relation to the identified environmental sensitive areas is provided in **Figure 51** below.



**Figure 51:** Preliminary PV development area in relation to identified environmental sensitive areas

A map showing the proposed PV development area which was presented in the scoping phase in relation to the identified environmental sensitive areas is shown in **Figure 52** below.



**Figure 52:** Proposed PV development area presented in scoping phase in relation to identified environmental sensitive areas

Based on a comparative assessment of the respective PV development areas in **Figure 51** and **Figure 52** above, it can be concluded that the proposed PV development area that was presented in the FSR is preferred from an environmental perspective. This is due to the following reasons:

- A 500m visual exclusion zone encroaches into one (1) of the preliminary PV development areas. This 500m visual exclusion zone is for a farmstead / dwelling which is located within the application site and is regarded as a 'No-Go' area;
- A CBA1 area which is found in the southern section of the application site (on the border of the Northern and Eastern Cape Provinces) encroaches onto a large portion of one (1) of the preliminary PV development areas. This CBA1 area is regarded as a 'No-Go' area from an ecological perspective as the disruption of these areas means that conservation planners have to find alternative sites to include in future CBAs according to an algorithm that seeks a least-cost outcome for preserving biodiversity. At some point, the loss of suitable sites leads to a situation where it is no longer possible to plan effective conservation networks or the cost of doing so increases due to a lack of choice;
- The location of on-site substation 4 and all other associated infrastructure has been amended to avoid the above-mentioned CBA1 area. On-site substation 4 was originally proposed to be situated within the CBA1 area (see **Figure 51**), however, the DEFF's Biodiversity Conservation Department provided comments on the DSR and stated that the location for on-site substation 4 was not supported (see **Table 39** in **section 9.10.1** and the C&RR attached as **Appendix 7E**); and

- The proposed PV development area has avoided all of the 'No-Go' areas which were identified by the respective specialists.

It should be noted that the proposed PV development area that was presented in the FSR (which was 'preferred' from an environmental perspective) in relation to the environmental sensitive areas was used to inform the layout alternatives which have been presented and assessed in the EIA phase of the proposed development. As such, all alternatives have been presented and extensively investigated and assessed in the EIA phase of the proposed development.

It should further be noted that PV modules will not necessarily be erected in the entire proposed PV development area, particularly where PV modules cannot be placed (e.g. under the existing 400kV transmission lines).

## 8.2 Description and Comparative Assessment of Alternatives

As previously mentioned, layout alternatives have been identified and comparatively assessed during the EIA phase. These include alternative locations for the laydown / staging areas and O&M buildings<sup>22</sup>.

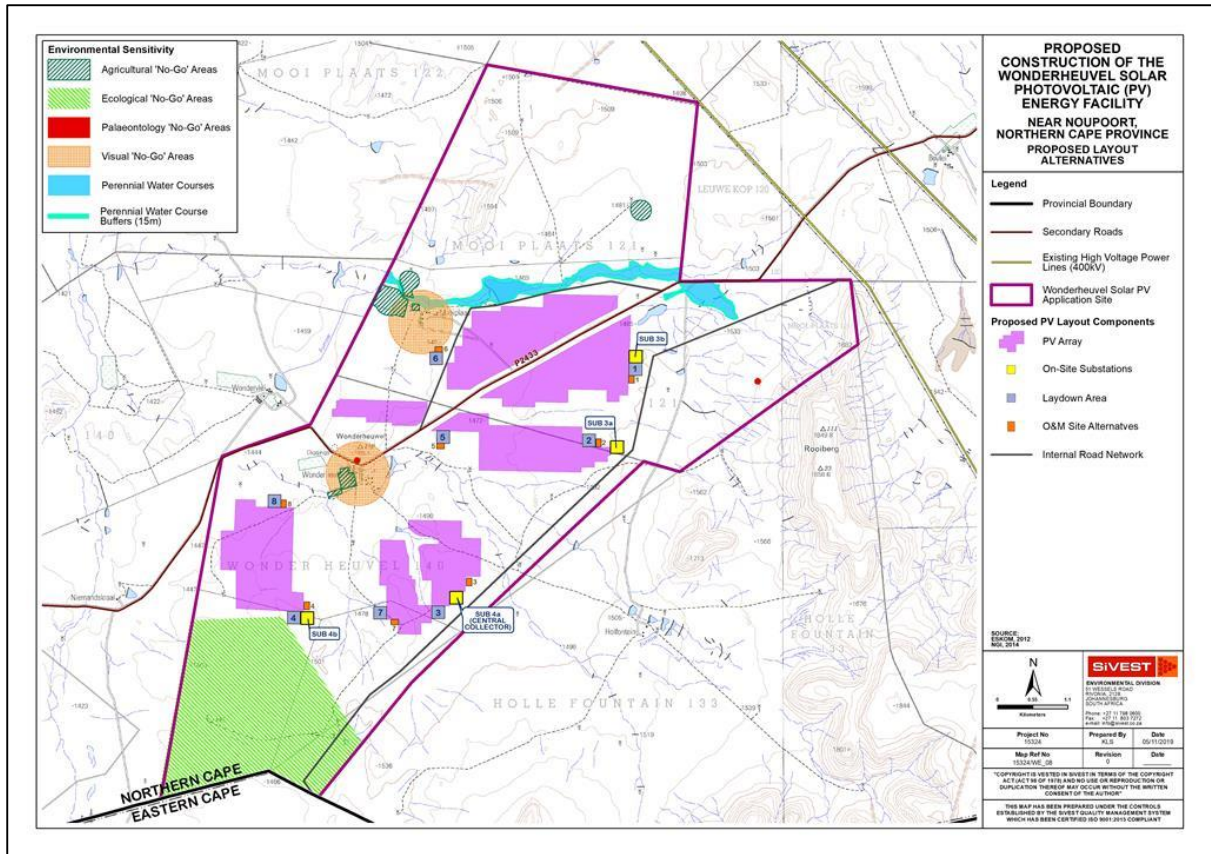
Various environmental specialists assessed the site during the scoping phase. Their assessments focussed on the entire application site and also included the identification of sensitive areas. Based on the specialist assessments which were conducted, a few potentially sensitive areas have been identified within the application site. These sensitive areas were subsequently used during the scoping phase to inform the area for the potential erection of PV modules within the application site (referred to as the PV development area). The identified sensitive areas were precluded from the proposed PV development area. These include the Terrestrial Ecologist, Palaeontologist, Surface Water, Heritage and Agricultural Specialists. In addition, the proposed PV development area that was presented in the DSR and FSR was further refined to avoid environmental sensitivities, and subsequently informed the location of the PV array areas and associated infrastructure alternatives which have been investigated and assessed in the EIA phase. The sensitive areas also informed the assessment of layout alternatives which have been further assessed during the EIA phase.

The proposed PV array areas and layout alternatives which were investigated and comparatively assessed in the EIA phase in relation to the identified environmental sensitive areas are presented in **Figure 53** below. Each of these alternatives have been comparatively assessed in terms of the findings from the specialist studies conducted during the EIA.

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<sup>22</sup> Although the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process with **DEFF Ref No.: 14/12/16/3/3/1/2134**), the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the substation sites proposed as part of this EIA application. As such, the results of the comparative assessment of grid connection infrastructure alternatives have been provided in this report to provide information regarding the substations proposed as part of this EIA application





**Figure 53:** Proposed PV array areas and layout alternatives for associated infrastructure in relation to environmental sensitive areas

**Table 33** below summarised the preferences associated with each alternative, thereby identifying the preferred alternative.

**Key**

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>NOT PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

**Table 33: Summary of comparative assessment of layout alternatives for Wonderheuveld Solar PV Energy Facility**

ALTERNATIVE	ENVIRONMENTAL ASPECT											FATAL FLAW (YES / NO)	PREFERRED (YES / NO)	
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage				
<b>TEMPORARY LAYDOWN / STAGING AREA AND OPERATION &amp; MAINTENANCE (O&amp;M) BUILDING SITE ALTERNATIVES</b>														
Laydown and Building Option 1	Area O&M Site	Favourable	Preferred	Favourable	Favourable	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 2	Area O&M Site	Favourable	Preferred	Favourable	Favourable	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 3	Area O&M Site	Least Preferred	Preferred	Favourable	Preferred	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 4	Area O&M Site	Favourable	Preferred	Favourable	Preferred	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES
Laydown and Building Option 5	Area O&M Site	Favourable	Least Preferred	Favourable	Favourable	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	NO
Laydown and Building Option 6	Area O&M Site	Favourable	Least Preferred	Least Preferred	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	NO



ALTERNATIVE	ENVIRONMENTAL ASPECT											FATAL FLAW (YES / NO)	PREFERRED (YES / NO)	
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage				
<b>TEMPORARY LAYDOWN / STAGING AREA AND OPERATION &amp; MAINTENANCE (O&amp;M) BUILDING SITE ALTERNATIVES</b>														
Laydown and Building Option 7	Area O&M Site	Least Preferred	Least Preferred	Favourable	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	NO	NO	
Laydown and Building Option 8	Area O&M Site	Favourable	Least Preferred	Least Preferred	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	NO	NO	

As depicted in the table above, majority of the specialists found there to be 'No Preference' between the alternatives, with the only exceptions being the Terrestrial Ecology, Surface Water, Visual, Geotechnical and Social specialists respectively. However, **Laydown Area and O&M Building Site Option 1, Option 2, Option 3 and Option 4** were found to be the most preferred alternatives from an environmental perspective as they were found to be either 'Preferred', Favourable' or have 'No Preference'. Option 3 was found to be 'Least Preferred' from a Terrestrial Ecology perspective due to the fact that it is in a drainage line, however, the Surface Water, Geotechnical and Social specialists found this alternative to be 'Preferred'. In addition, the Surface Water specialist stated that this alternative will be close to or within disturbance corridors for the power lines and will result in a low impact. As such, Option 3 is still considered to be an environmentally acceptable alternative. In addition, no fatal flaws were identified. Laydown Area and O&M Building Site Options 5 – 8 are considered to be the least preferred alternatives from an environmental perspective as these were found to be 'Least Preferred' from the most specialists. Option 5 was 'Least Preferred' from both Surface Water and Social perspectives, while Options 6 and 8 were found to be 'Least Preferred' from Surface Water, Visual and Social perspectives respectively. Option 7 is 'Least Preferred' from Terrestrial Ecology, Surface Water and Social perspectives. In light of this, **Laydown Area and O&M Building Site Option 1, Option 2, Option 3 and Option 4 are the most preferred layout alternatives from an environmental perspective and are being proposed for authorisation**. It should be noted that no fatal flaws were identified and therefore Laydown Area and O&M Building Site Options 1 – 4 are considered to be acceptable alternatives.

It should be noted that three (3) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have also been comparatively assessed by the respective specialists<sup>23</sup>. These alternatives essentially provide for three (3) different route alignments with associated substations (on-site and collector) contained within an assessment corridor between approximately 400m and 900m wide. This is to allow for flexibility to route the power line on either side of the existing high voltage Eskom power lines. It should be noted that the substation sites included as part of this application are intrinsically linked to the associated electrical infrastructure project (part of a separate BA process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). The results of the comparative assessment of grid connection infrastructure alternatives have however been provided in this report as the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the on-site and collector substation sites being proposed as part of this EIA application.

The results of the comparative assessment of grid connection infrastructure alternatives are summarised in **Table 34** below.

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<sup>23</sup> Based on the pre-application meeting held with the DEFF on 19 February 2019, it was confirmed that the specialists could compile one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects as well as the three (3) associated grid infrastructure developments (on-site substation sites, collector substation sites and 132kV power line corridors), provided the findings and impact assessment sections are project-specific. A copy of the pre-application meeting minutes is provided in **Appendix 9B**

**Table 34:** Summary of comparative assessment of layout alternatives for Wonderheuveld Grid Connection Infrastructure

ALTERNATIVE	ENVIRONMENTAL ASPECT										FATAL FLAW (YES / NO)	PREFERRED (YES / NO)
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage		
<b>GRID CONNECTION INFRASTRUCTURE (132kV POWER LINE AND ON-SITE AND COLLECTOR SUBSTATIONS) ALTERNATIVES</b>												
Grid Connection Option 1a	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1b	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1c	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1d	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 2a	Preferred	Favourable	Favourable	Preferred	Preferred	Favourable	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>
Grid Connection Option 2b	Preferred	Favourable	Favourable	Preferred	Preferred	Favourable	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>
Grid Connection Option 3	Preferred	Preferred	Favourable	Preferred	Preferred	Preferred	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>

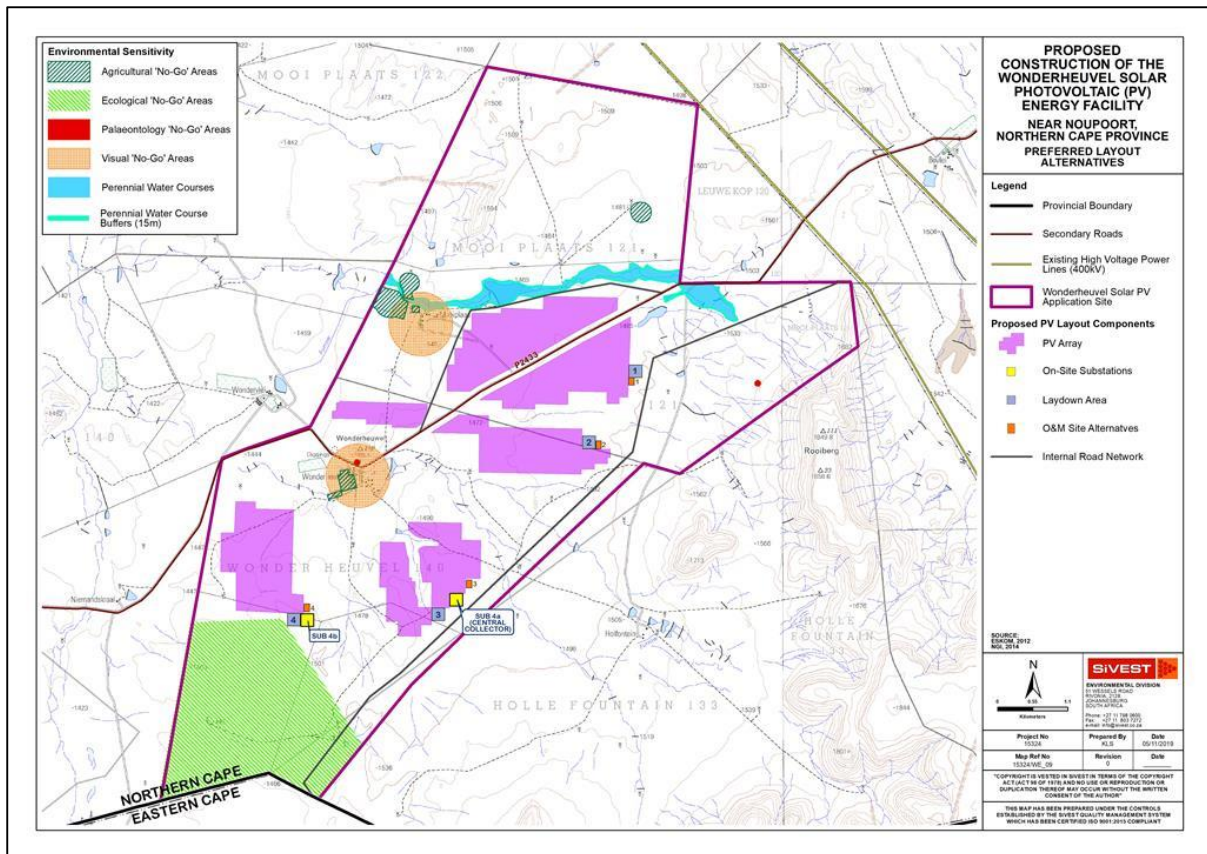
In terms of the grid connection infrastructure alternatives, **Grid Connection Option 3** was found to be the most preferred alternative from an environmental perspective. This is due to the fact that majority of the specialists (namely Terrestrial Ecology, Surface Water, Geotechnical, Avifauna and Social) found this alternative to be 'Preferred'. In addition, this alternative was found to be 'Favourable' from Visual and Heritage perspectives respectively, while the remainder of the specialists found there to be 'No Preference'. Grid Connection Option 1a, 1b, 1c and 1d are considered to be the least preferred alternatives from an environmental perspective as these were found to be 'Not Preferred' from Terrestrial Ecology, Surface Water, Visual, Avifauna and Social perspectives respectively. As such, these alternatives are not deemed to be acceptable grid connection infrastructure alternatives from an environmental perspective. As mentioned, the substation site alternatives are intrinsically linked to the associated electrical infrastructure project alternatives (which include on-site and collector substation sites and 132kV power line corridors) being assessed part of a separate BA process (**DEFF Reference Number: 14/12/16/3/3/1/2134**). The preferences for the grid connection infrastructure alternatives have thus informed the location of the substation sites which are being proposed as part of this EIA application. In light of the above, **Substation 4a (Central Collector) and Substation 4b** are being proposed for authorisation, as these are intrinsically linked to **Grid Connection Option 3** which is preferred from an environmental perspective for the associated electrical infrastructure project. These substation locations align with the preferences for the grid connection alternatives being assessed as part of the associated electrical infrastructure project.

Based on the results of the comparative assessment of alternatives, the following alternatives are preferred:

- **Laydown Area and O&M Building Site Option 1;**
- **Laydown Area and O&M Building Site Option 2;**
- **Laydown Area and O&M Building Site Option 3;**
- **Laydown Area and O&M Building Site Option 4;**
- **Substation 4a (Central Collector Substation); and**
- **Substation 4b (On-site Substation).**

It is requested that the above-mentioned alternatives be authorised by the DEFF<sup>10</sup>. The substation site alternatives (on-site and collector) being proposed as part of this application also align with the preferences for the substation sites associated with the proposed electrical infrastructure project (part of a separate on-going BA process with **DEFF Ref No.: 14/12/16/3/3/1/2134**). It must be noted that the specialist sensitivities and 'no-go' areas informed the location of all alternatives and have been incorporated into the layout design of the preferred site layout. In addition, no fatal flaws were identified and therefore all of the alternatives mentioned above are considered to be acceptable, although not necessarily preferable from an environmental perspective.

The preferred site layout in relation to the sensitive areas identified by the specialists is indicated in **Figure 54** below.



**Figure 54:** Preferred site layout in relation to identified environmental sensitive areas

Refer to **Appendix 9A** for the coordinates of the preferred site layout.

## 9 PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA process. The principles of NEMA as well as the EIA Regulations, 2014 (as amended), govern the EIA process, including public participation. These include provision of sufficient and transparent information on an on-going basis to Interested and/or Affected Parties (I&APs) and key stakeholders, such as Organs of State (OoS) / authorities, to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth.

The public participation process is primarily based on two (2) factors.

1. Firstly, on-going interaction with the environmental specialists and the technical teams in order to achieve integration of technical assessment and public participation throughout; and
2. Secondly, to obtain the bulk of the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to stakeholders for verification that their issues have been captured and for further comment.

Input into the public participation process by members of the public, I&APs and key stakeholders can be given at various stages of the EIA process. Registration on the project database can take place at

any time during the EIA process up until the final EIA report is submitted to the DEFF for decision-making. There are however established periods in which comments are required from I&APs and key stakeholders in order to ensure that these are captured in time for the submission of the various reports. The comment periods during the scoping phase were implemented according to the EIA Regulations, 2014 (as amended). The comment periods which were implemented during the scoping phase (as set out by the NEMA EIA Regulations, 2014, as amended) were as follows:

- Comment and review period for the Draft Scoping Report (DSR): 30 days (excluding public holidays and DEFF's closure period).

The comment periods which were implemented during the EIA Phase (as set out by the NEMA EIA Regulations, 2014, as amended), included the following:

- Comment and review period for the Draft Environmental Impact Assessment Report (DEIAR): 30 days (excluding public holidays and DEFF's closure period).

As stipulated in the EIA Regulations, 2014 (as amended), the DSR underwent a 30-day comment and review period that ran from Friday 26 July 2019 until Monday 26 August 2019 (excluding public holidays). Following the completion of the 30-day comment and review period for the DSR, the DSR was updated and the FSR was submitted to the DEFF on Friday 06 September 2019. All I&APs and key stakeholders, such as OoS / authorities, who are registered on the project database were notified of the submission of the FSR. After evaluating the FSR the DEFF indicated that SiVEST could proceed with the EIA process (i.e. DEIAR and FEIAR). The DEIAR was subsequently circulated for public participation for a period of 30 days (excluding public holidays and the DEFF's closure period), from Friday 22 November 2019 until Monday 13 January 2020. All I&APs and key stakeholders, such as OoS / authorities, which are registered on the project database were notified of the submission of the DEIAR and the above-mentioned 30-day public review and comment period accordingly. In addition, all OoS / authorities were sent electronic copies (on CD) of the DEIAR. It should be noted that two (2) meetings were undertaken during the DEIAR review and comment period, namely one (1) Public Meeting and one (1) Focus Group Meeting (FGM). Invitations to these meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&APs and key stakeholders (including affected and adjacent landowners) on the project database. Additionally, Ward Councilors were utilised in order to distribute / share information with members of the affected communities. Members of the affected communities were encouraged to contact SiVEST in order to register as an I&AP on the project database and to obtain project information and/or notifications (**section 9.9**). Comments received on the DEIAR were taken into consideration, incorporated into the report (where possible) and were used when compiling this FEIAR. The FEIAR was submitted to the DEFF for decision-making on Thursday the 13<sup>th</sup> of February 2020.

Any I&APs and key stakeholders that wished to register on the project's database or comment on the DSR, FSR and DEIAR were encouraged to contact SiVEST environmental division as follows:

Contact: Hlengiwe Ntuli or Stephan Jacobs

📮 PO Box 2921, RIVONIA, 2128

☎ Phone:(011) 798 0600

✉ E-mail:[hlengiwen@sivest.co.za](mailto:hlengiwen@sivest.co.za) / [stephanj@sivest.co.za](mailto:stephanj@sivest.co.za) / [sivest\\_ppp@sivest.co.za](mailto:sivest_ppp@sivest.co.za)

The EIA Regulations, 2014 (as amended), emphasise the importance of public participation. In terms of these regulations, registered I&APs and key stakeholders –

- may participate in the application process;
- must comment within the timeframes as stipulated by the EIA Regulations, 2014 (as amended);
- must send a copy of any comments to the applicant or EAP if the comments were submitted directly to the competent authority; and
- must disclose any direct business, financial, personal or other interests that the person has in the application being granted or refused.

Further, in terms of the EIA Regulations, 2014 (as amended), the EAP:

- manages the application process;
- must be independent;
- must undertake the work objectively, even if this results in views and findings that are not favourable to the applicant;
- must disclose material information that may influence the decision; and
- must conduct a public participation process.

It should be noted that the Public Participation Process was undertaken in line with Chapter 6 of the EIA Regulations, 2014 (as amended). Comments / queries / issues / concerns related to the proposed development which were received throughout the EIA process have been included in **Appendix 7D**. The following actions were undertaken upon receiving comments / queries / issues:

- Once a comment / query / issue / concern had been obtained from an I&AP and/or key stakeholder who had not yet been included in the project database, the contact details provided were included in the project database for use in future notifications;
- Comments were addressed in an email (if required) or in the Comments & Response Report (C&RR);
- The C&RR has been included in the FEIAR (**Appendix 7E**);
- The C&RR was updated throughout the EIA process to address any additional comments / queries / issues / concerns received; and
- The C&RR was made available to all I&APs and key stakeholders within the FSR and DEIAR. The C&RR has also been made available to all I&APs and key stakeholders within the FEIAR.

The sub-sections below detail the Public Participation Process which has been undertaken to date.

## 9.1 Objectives of Public Participation

An understanding of what the public participation is, and is what it is not, needs to be explored and must be clarified.

- Public Participation is:
  - A communication mechanism to inform I&APs and key stakeholders regarding a proposed development; and
  - A communication mechanism to record comments and/or concerns regarding a proposed development raised during the relevant phases of the EIA process by I&APs and key stakeholders.
  
- Public Participation is not:
  - A marketing exercise;
  - A process to address grievances but rather to record comments and/or concerns raised; and
  - One-on-one consultation with each I&AP and/or key stakeholder during the EIA process.

The primary aims of the Public Participation Process were:

- To inform I&APs and key stakeholders of the proposed development;
- To initiate meaningful and timeous participation of I&APs and key stakeholders;
- To identify issues and/or concerns of key stakeholders and I&APs with regards to the proposed development;
- To promote transparency and an understanding of the proposed development and its potential environmental impacts;
- To provide information used for decision-making;
- To provide a structure for liaison and communication with I&APs and key stakeholders;
- To assist in identifying potential environmental impacts associated with the proposed development;
- To ensure inclusivity (the views, needs, interests and values of I&APs and key stakeholders must be considered in the decision-making process);
- To focus on issues relevant to the proposed development and issues considered important by I&APs and key stakeholders;
- To provide responses to I&AP and key stakeholder queries / comments / concerns;
- To encourage co-regulation, shared responsibility and a sense of ownership; and
- Meet the requirements for Public Participation as stated in Chapter 6 of the EIA Regulations, 2014 (as amended).

In addition to the guidance of the Public Participation Process in the EIA Regulations, 2014 (as amended), every effort was also made to conform to the requirements of the Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000).

## **9.2 Overview of the Public Participation Process undertaken throughout the EIA process**

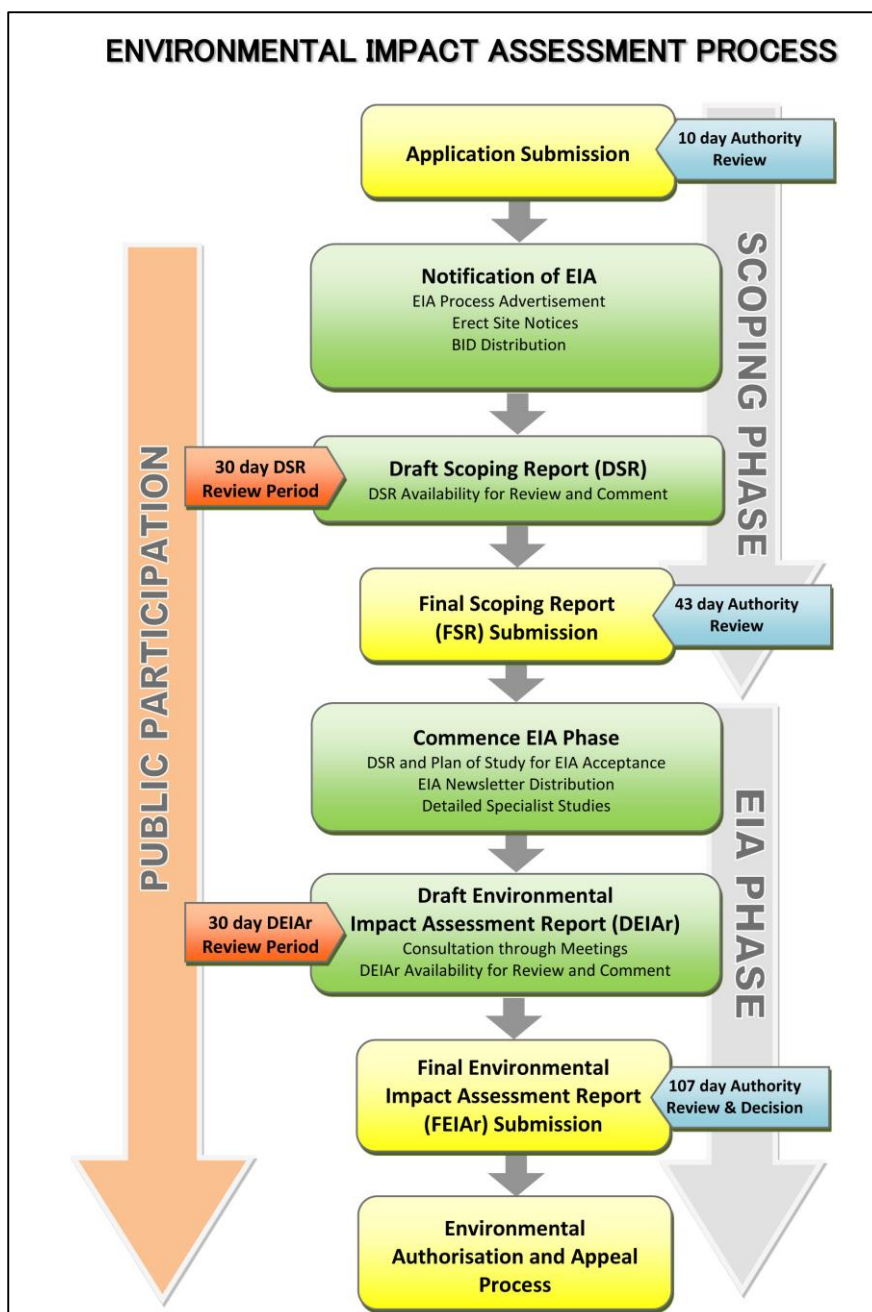
As mentioned, the Public Participation Process was undertaken in line with Chapter 6 of the EIA Regulations, 2014 (as amended).



The public participation process was initiated in July 2019 with initial landowner consultation and has included the following activities to date:

- An I&AP database was compiled which includes all affected landowners, adjacent landowners, occupiers of affected and adjacent land, other I&APs, key stakeholders (such as OoS / authorities) and other surrounding project developers. The I&AP database is included in **Appendix 7F**.
- Contacting all affected and adjacent landowners to request contact details of the occupiers residing on their land. Proof of this is included in **Appendix 7H**. It should be noted that SiVEST were unable obtain contact details for one (1) of the adjacent landowners / occupiers as contact details for this landowner / occupier are unknown. Attempts were made to obtain these contact details, to no avail. This Landowner / occupier was however notified via a notification letter which was attached to the entrance gate of the property in question. Proof of this is included in **Appendix 7H**. **Table 36** provides details regarding the landowners / occupiers (affected and adjacent) who have been contacted and/or notified with regards to the EIA process, as well as the method in which they were contacted.
- Public notification of the EIA process was advertised (in English and Afrikaans) in a local / regional newspaper (namely the Graaff-Reinet Advertiser), as required under the EIA Regulations, 2014 (as amended), on the 3<sup>rd</sup> of July 2019. Proof of the advertisements is provided in **Appendix 7C**.
- The affected and adjacent / surrounding landowners and/or occupiers were notified about the proposed development via a notification letter. Proof of these notifications is included in **Appendix 7H**. As mentioned, one (1) of the adjacent / surrounding landowners / occupiers could not be notified about the proposed development as contact details for this landowner / occupier are unknown. Attempts were made to obtain these contact details, to no avail. This Landowner / occupier was however notified via a notification letter which was attached to the entrance gate of the property in question. Proof of this is included in **Appendix 7H**. **Table 36** provides details regarding the landowners / occupiers (affected and adjacent) who have been contacted and/or notified with regards to the EIA process, as well as the method in which they were contacted.
- A Background Information Document (BID) (English and Afrikaans) was compiled and distributed to I&APs and key stakeholders registered on the project database on Friday the 26<sup>th</sup> of July 2019, along with written notification to all I&APs and key stakeholders. Copies of the BID as well as the written notifications to all I&APs and key stakeholders are provided in **Appendix 7B**. Proof of distribution is also included in **Appendix 7B** of this report.
- English and Afrikaans site notices (as per regulations) were placed within the study area during a site visit undertaken on the 12<sup>th</sup> of July 2019. Proof of the site notices is shown in **Appendix 7A**. Refer to **section 9.6** for more information regarding the site notices.
- Posters (English and Afrikaans) were erected at a public venue in the town of Noupoort. In addition, hard copies of the BIDs (English and Afrikaans) were also distributed at this venue. Proof of the posters which were erected and the BIDs which were distributed is included in **Appendix 7B**.
- The DSR was released for public review and comment on Friday the 26<sup>th</sup> of July 2019 and remained in the public domain for 30 days, until Monday the 26<sup>th</sup> of August 2019. Refer to **Appendix 7B** and **Appendix 7I**.

- All OoS were sent electronic copies (on CD) of the DSR, which was made available for review and comment for a period of 30-days (excluding public holidays). Reminder notifications of the closing of the DSR comment period were sent out on Monday the 19<sup>th</sup> of August 2019 and Friday the 23<sup>rd</sup> of August 2019 respectively (prior to the DSR comment period ending), in order to ensure that comments and/or concerns were received from the OoS. Refer to **Appendix 7I**. It should be noted that attempts were made to contact all key stakeholders / organs of state who did not comment on the DSR (refer to **Table 37**).
- A hard copy of the DSR was also available from the Noupoot public library, and an electronic copy was made available on SiVEST's website: <http://www.sivest.co.za/>, click on 'Downloads' then browse to the folder '15324 Wonderheuvél Solar PV'.
- Comments received on the DSR were included in the FSR, which was submitted to the DEFF on Friday 06 September 2019.
- The DEFF acknowledged having received the FSR on Monday 09 September 2019, via a letter dated 08 October 2019, and subsequently accepted the FSR and EIA Plan of study (**Appendix 4**).
- An EIA Newsletter was sent out to all I&APs and key stakeholders on 17 October 2019 in order to notify them of the initiation of the EIA phase of the proposed development. Refer to **Appendix 7B** and **Appendix 7I**.
- The DEIAr was submitted to the DEFF on 22 November 2019 and was also made available for a 30-day review and comment period from 22 November 2019 to 13 January 2020.
- Notifications were sent out to all I&APs, landowners / occupiers, OoS / authorities and/or key stakeholders.
- A hard copy of the DEIAr was made available from the Noupoot public library, and an electronic copy was also made available on SiVEST's website: <http://www.sivest.co.za/>, click on 'Downloads' then browse to the folder '15324 Wonderheuvél Solar PV'.
- The public and FGMs were held on the 26<sup>th</sup> of November 2019, during the 30-day DEIAr review and comment period. Invitations to these meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&APs and key stakeholders (including affected and adjacent landowners) on the project database (**Appendix 7B**).
- Additionally, Ward Councilors were utilised in order to distribute / share information with members of the affected communities. Members of the affected communities were encouraged to contact SiVEST in order to register as an I&AP on the project database and to obtain project information and/or notifications (**section 9.9**).
- The stages that typically form part of the public participation process during the scoping phase of the EIA process are reflected in **Figure 55** below.



**Figure 55:** EIA and Public Participation Process

On-going consultation with key stakeholders (e.g. provincial, district and local authorities, relevant government departments, local business etc.) and identified I&APs ensured that I&APs and key stakeholders were kept informed regarding the EIA process. Networking with I&APs and key stakeholders effectively continued throughout the EIA process until the final EIA report was submitted to the DEFF for decision-making. Where required, key stakeholders and I&APs were engaged on an individual basis.

During the EIA process, individuals, businesses, institutions and organisations, and the following sectors of society were identified and afforded the opportunity to comment and/or raise concerns (the full stakeholder / Organ of State database is included in **Appendix 7I**):

- National Authorities;
- Provincial Authorities;
- Umsobomvu Local Municipality;
- Pixley ka Seme District Municipality;
- Government Structures such as SAHRA, SANRAL, SENTECH, Eskom Telkom, etc.;
- Agriculture Associations;
- Department of Agriculture Forestry and Fisheries (DAFF);
- Environmental bodies / Non-Government Organisations (NGOs);
- DEFF: Biodiversity Conservation Department;
- BirdLife SA (BLSA);
- Department of Water and Sanitation (DWS);
- Community representatives, CBOs, development bodies;
- Landowners;
- I&APs;
- Civil Aviation Authority (CAA);
- Square Kilometre Array (SKA);
- All telecommunication service providers; and
- Air Traffic and Navigation Services (ATNS).

### 9.3 Landowner Consent and Notification

Regulation 39 (1) of the EIA Regulations, 2014 (as amended), states that “*if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land*”.

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

Majority of the proposed Wonderheuveld Solar PV Energy Facility development constitutes a non-linear activity, and landowner consent is therefore required for the following land portions:

**Table 35:** Land portions where consents for the EIA process to occur was obtained.

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL (SG) CODE
Remainder of the Farm Mooi Plaats No. 121	C03000000000012100000
Portion 3 of the Farm Wonder Heuveld No. 140	C03000000000014000003
Portion 5 of the Farm Holle Fountain No. 133	C03000000000013300005

The landowners and/or occupants of the above-mentioned farm portions, on which the Wonderheuveld Solar PV Energy Facility is proposed, have been notified accordingly. The notification has been included as **Appendix 7H** and has been submitted to the DEFF for consideration together with the FEIAR for

comment. In addition, landowner consent forms have been obtained for the landowners of the above-mentioned farm portions and have been included in **Appendix 7H**.

In terms of the Chapter 6, Section 39 of the EIA Regulations, 2014 (as amended), notification of directly adjacent landowners and occupiers is required. As a result, the affected and adjacent landowners were notified of the proposed development accordingly. Please refer to **Appendix 7H** for proof of this correspondence. With regards to occupiers, all landowners and adjacent landowners were approached in order to confirm whether anyone was occupying their respective properties, as well as to determine the best method to notify the occupiers of each property.

It should be noted that all of the adjacent landowners / occupiers were be notified about the proposed development. SiVEST were unable to obtain contact details for one (1) of the adjacent landowners / occupiers. Attempts were made to obtain these contact details, to no avail. This landowner / occupier was however notified via a notification letter which was attached to the entrance gate of the property in question. Proof of this is included in **Appendix 7H**.

The table below provides details regarding the landowners / occupiers (affected and adjacent) who have been contacted and/or notified with regards to the EIA process, as well as the method in which the landowners / occupiers were contacted. As mentioned above, landowners / occupiers who the EAP was unable to contact via email or phone were notified via a notification letter which was attached to the entrance gate of their property. Proof of this is included in **Appendix 7H**.

**Table 36:** Landowner Notification

Landowners (Affected and Adjacent)				Occupier Details Requested	Method of Contact				Date	Follow-up to be done in EIA Phase & Method for Follow-up
Landowner (Affected or Adjacent)	ERF	Farm Name	Contact Name		Phone	Email	SMS	Registered Post		
Adjacent Landowner	2/62	Paarde Valley	Abbott Erasmus / Neil Erasmus	✓	✓			19-Jul-19		
Adjacent Landowner	RE/62	Paarde Valley	Abbott Erasmus / Neil Erasmus	✓	✓			19-Jul-19		
Adjacent Landowner	1/113	Elands Heuvel	Ilze Nel (Curator for property)	✓	✓	✓	✓	08-Aug-19		
Adjacent Landowner	RE/146	Elands Heuvel	UNKNOWN. SiVEST unable to obtain contact details of landowner / occupier. Numerous attempts were made to obtain contact details, to no avail. A notification letter was however attached to entrance gate of property in question during week of 25-29 November 2019. Proof included in <b>Appendix 7H</b> .						✓ - Numerous attempts were made to obtain contact details, to no avail. Notification letter attached to entrance gate of property in question during week of 25-29 November 2019. Proof included in <b>Appendix 7H</b>	
Adjacent Landowner	3/133	Holle Fountain	Bovlei Boerdery Trust (Lindo van der Merwe)	✓	✓			19-Jul-19		
Adjacent Landowner	4/133	Holle Fountain	Gillmer Fauntleroy Bartholomew (Faunty Gillmer)	✓	✓			19-Jul-19		
<b>Affected Landowner</b>	5/133	Holle Fountain	Andries Johannes Keun	✓	✓			19-Jul-19		

Adjacent Landowner	RE/133	Holle Fountain	Gillmer Fauntleroy Bartholomew (Faunty Gillmer)	✓		✓			19-Jul-19	
Adjacent Landowner	1/120	Leuwe Kop	Lindo van der Merwe (might be in the name of Wilgefontein Trust)	✓		✓			19-Jul-19	
<b>Affected Landowner</b>	RE/121	Mooi Plaats	Andries Johannes Keun	✓		✓			19-Jul-19	
Adjacent Landowner	RE/122	Mooi Plaats	JJ van Lingen Family Trust (Philip van Lingen)	✓	✓	✓	✓		SMS sent 26-Jul-19 Email sent 08-Aug-19	
Adjacent Landowner	6/3	Uitzicht	Lindo van der Merwe (might be in the name of Wilgefontein Trust)	✓		✓			19-Jul-19	
Adjacent Landowner	1/140	Wonder Heuvel	JJ van Lingen Family Trust (Philip van Lingen)	✓	✓	✓	✓		SMS sent 26-Jul-19 Email sent 08-Aug-19	
Adjacent Landowner	2/140	Wonder Heuvel	Gillmer Fauntleroy Bartholomew (Faunty Gillmer)	✓		✓			19-Jul-19	
<b>Affected Landowner</b>	3/140	Wonder Heuvel	Andries Johannes Keun	✓		✓			19-Jul-19	
Adjacent Landowner	4/140	Wonder Heuvel	Gillmer Fauntleroy Bartholomew (Faunty Gillmer)	✓		✓			19-Jul-19	
Adjacent Landowner	RE/140	Wonder Heuvel	JJ van Lingen Family Trust (Philip van Lingen)	✓	✓	✓	✓		SMS sent 26-Jul-19 Email sent 08-Aug-19	

## 9.4 Notification of Stakeholders and I&APs

In line with Regulation 41 (2) (b) of GN R. 982 (as amended) and prior to the commencement of the scoping and EIA Process (and advertising the EIA Process in the local print media), an initial database of I&APs (including key stakeholders such as OoS / authorities) was developed for the scoping and EIA Process. This was supplemented with input from the applicant as well as the EAP's experience. **Appendix 7F** contains a detailed copy of the I&AP database. All relevant key stakeholders and I&APs were added to the project database.

In line with Regulation 41 (2)(b) of the EIA Regulations, 2014 (as amended), the database included the details of the following:

- Landowners of the affected farm portions;
- Landowners of the neighbouring adjacent farm portions;
- Contact details of known occupiers of the affected farm portions and neighbouring adjacent farm portions (Refer to **Appendix 7H**);
- The municipal councilors of the wards in which the proposed development will be undertaken;
- The municipalities which have jurisdiction in the areas (i.e. the Umsobomvu Local Municipality and the Pixley ka Seme District Municipality);
- Relevant OoS / authorities that have jurisdiction in respect of any aspect of the activity; and
- Any other party as required by the DEFF.

Communication with I&APs and key stakeholders was conducted by means of telephone and email in order to obtain the necessary background information to compile this report. In addition, one (1) of the adjacent landowners / occupiers who the EAP was unable to contact via email or phone was notified via a notification letter which was attached to the entrance gate of their property (**Appendix 7H**).

An advertisement was placed in the Graaff-Reinet Advertiser local / regional newspaper on 04 July 2019. Proof of the above-mentioned advertisement that was placed is provided in **Appendix 7C**.

In addition, site notices (as per regulations) were erected on one (1) of the boundaries of the application site (boundary of Remainder of the Farm Mooi Plaats No. 121 and Portion 3 of the Farm Wonder Heuvel No. 140) during a site visit undertaken on the 12<sup>th</sup> of July 2019. Proof of the site notices which were erected (including GPS coordinates) is provided in **Appendix 7A**.

As I&APs and key stakeholders responded to the above-mentioned advertisements, they were registered on the project database and sent letters of invitation to participate, as well as the BID. The EAP continued to register I&APs and key stakeholders on the project database and sent them letters of invitation to participate as well as the BID, as they responded to the above-mentioned advertisements.

It should be noted that all key stakeholders and I&APs which were registered on the project database accordingly received written notification of the commencement of the EIA process, as well as a copy of the BID. In addition, they also received written notification of the commencement of the EIA process and the availability of the DSR, FSR and DEIAr for review and comment. All OoS were also sent



electronic copies (on CD) of the DSR and DEIAr for comment and review. Refer to **Appendix 7B** and **Appendix 7I**.

The identification and registration of I&APs and key stakeholders was on-going for the duration of the study. Stakeholders from a variety of sectors, geographical locations and/or interest groups were expected to show an interest in the proposed development, for example:

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

## 9.5 Proof of Notification

**Appendix 7** includes the proof of all notifications to I&APs and key stakeholders. More specifically, the types of proofs are as follows:

- Site notice text (**Appendix 7A**);
- Photographs of site notices (**Appendix 7A**);
- Background Information Document (BID) (**Appendix 7B**);
- Proof of BID Distribution (**Appendix 7B**);
- Notification of commencement of EIA process (**Appendix 7B**);
- Proof of advertisements in a local/regional newspaper (**Appendix 7C**);
- Notification to landowners of affected and neighbouring adjacent farm portions (**Appendix 7H**);
- Notification to Organs of State (OoS) (**Appendix 7I**);
- Notification of DSR comment period commencing and ending (**Appendix 7B**);
- Notification of FSR submitted to DEFF (**Appendix 7B** and **Appendix 7I**);
- Notification of DEFF acceptance of FSR (**Appendix 4**);
- EIA Newsletter (**Appendix 7B** and **Appendix 7I**); and
- Notification of DEIAr Comment Period Commencing and ending (**Appendix 7B**);
- Notification of and invitation to Public Meeting and FGM (**Appendix 7B**); and
- Notification of FEIAr submitted to DEFF.

## 9.6 Site Notices

As mentioned, site notices were erected on one (1) of the boundaries of the application site (boundary of Remainder of the Farm Mooi Plaats No. 121 and Portion 3 of the Farm Wonder Heuvel No. 140) (coordinates: 31°19'56.27"S; 24°41'45.51"E). Site notices (in the form of posters) and BID's were also placed at the following location:

- Noupoot Public Library.

## 9.7 Comment and Review of Draft Environmental Impact Assessment Report (DEIAR)

The DEIAR was circulated to all I&APs and key stakeholders for comment and review for a period of 30 days after submission to the DEFF, from **Friday the 22<sup>nd</sup> of November 2019** to **Monday the 13<sup>th</sup> of January 2020**, excluding public holidays and the DEFF's closure period from 15 December 2019 to 05 January 2020.

The report was made available to the public for review and comment for a period of 30 calendar days, excluding public holidays and the DEFF's closure period from 15 December 2019 to 05 January 2020. Hard copies of the DEIAR could be reviewed at the following public place (see **Appendix 7A** for proof):

VENUE	STREET ADDRESS	HOURS	CONTACT NO
Noupoort Public Library	Shaw Street Noupoort 5950	<b>Monday - Friday</b> 10:00 - 13:00 13:45 - 16:30	049 843 1056

The report could also be downloaded from SiVEST's website during the 30-day comment and review period: <http://www.sivest.co.za/>, click on 'Downloads' then browse to the folder '15324 Wonderheuveld Solar PV'.

Written notice was given to all registered I&APs and key stakeholders on the project database that the DEIAR was available for comment and review (**Appendix 7B**). Electronic copies (CD) of the DEIAR were also be distributed on written request.

All issues, comments and concerns raised were captured in the Comments and Response Report (C&RR), which is included in **Appendix 7E**. This includes all comments received following the 30-day comment and review period of the DEIAR. The C&RR provides a summary of the issues and concerns raised, as well as responses provided to I&APs and key stakeholders. A detailed C&RR is included in **Appendix 7E** of the FEIAR.

## 9.8 Review of the DEIAR by Organs of State (OoS)

In terms of section 40 (2) of the EIA Regulations, 2014 (as amended), public participation must include consultation with all OoS which have jurisdiction in respect of the activity to which the application relates.

**Table 37** below includes all the OoS who were e-mailed the DEIAR and sent electronic copies (on CD) of the full report, including all appendices. Telephonic follow-up was done throughout the 30-day DEIAR comment and review period in order to provide them with ample opportunity to comment.

It should be noted that all OoS listed in the table below will be notified about the submission of the FEIAR to the DEFF for decision-making.

**Table 37:** Organs of State (OoS) database

DISTRIBUTION OF THE FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT (FEIAR) TO ORGANS OF STATE FOR COMMENT						
TITLE	SURNAME	NAME	POSITION	POSTAL ADDRESS	EMAIL ADDRESS	RESPONSE / RECEIPT OF COMMENTS
<b>UMSOBOMVU LOCAL MUNICIPALITY</b>						
Ms	Qumba	Fundiswa		Church Street 21A COLESBERG 9795	<a href="mailto:qumba@umsobomvumun.co.za">qumba@umsobomvumun.co.za</a> <a href="mailto:qumbafundiswa@gmail.com">qumbafundiswa@gmail.com</a>	<b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Comments received 20 August 2019.
Mr	Mpela	Amos	Municipal Manager	Church Street 21A COLESBERG 9795	<a href="mailto:mpela@umsobomvumun.co.za">mpela@umsobomvumun.co.za</a>	<b>EIA Phase</b> Access to an electronic copy of the report was emailed on 22 November 2019. Reminder of the DEIAR comment period ending was sent out on the 8th and 13th of January 2020. Attempts thereafter made to contact Ms Qumba for comment via telephone, she advised that this issue will be handled by Mr Nkondeshe who is in the District Municipality. Any comments received after the FEIAR has been submitted will be forwarded to the DEFF.
<b>PIXLEY KA SEME DISTRICT MUNICIPALITY</b>						

Mr	Nkondeshe	Sonwabile		Culvert Road, Industrial Area DE AAR 7000	-	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the district municipality for comment via telephone on the 26 August 2019 to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 22 November 2019. Reminder of the DEIAr comment period ending was sent out on the 8th and 13th of January 2020. Attempts thereafter made to contact Mr Nkondeshe and he informed Sivest that he will go through the reports then send through comments if he has any. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>AGRI SA-NORTHERN CAPE</b>						

Mr	Myburg	Henning	General Manager	PO Box 1094 KIMBERLEY 8300	<a href="mailto:henning@agrink.co.za">henning@agrink.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Comments received 20 August 2019.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts thereafter made to contact Mr Myburg for comment via telephone he informed Sivest that he will go through the reports then send through comments if he has any. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>AIR TARRIFIC NAVIGATION SERVICES (ATNS)</b>						
Ms	Morobane	Johanna	Manager: Corporate Sustainability and Environment	Private Bag X15 KEMPTON PARK 1620	<a href="mailto:JohannaM@atns.co.za">JohannaM@atns.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via</p>

Ms	Masilela	Simphiwe	Obstacle Evaluator	Private Bag X15 KEMPTON PARK 1620	<a href="mailto:SimphiweM@atns.co.za">SimphiweM@atns.co.za</a>	<p>telephone on the 26 August 2019 and Sivest was informed that comments will be sent on the next phase.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts thereafter made to contact Ms Masilela but she no longer works for ATNS. An email was sent to Graham Mondzinger for comment . Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>BIRDLIFE SOUTH AFRICA (BLSA)</b>						
Mr	Booth	Jonathan	Policy Manager	PO Box 515 RANDBURG 2125	<a href="mailto:advocacy@birdlife.org.za">advocacy@birdlife.org.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Comments received 28 August 2019.</p>
Ms	Ralston	Samantha		PO Box 515 RANDBURG 2125	-	<p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Comments</p>

						from BirdLife received on 30 January 2020.
<b>ENDANGERED WILDLIFE TRUST (EWT)</b>						
Mr	Little	Ian	Senior Manager	Kirstenbosch National Botanical Garden Rhodes Drive Newlands Cape Town	<a href="mailto:ianl@ewt.org.za">ianl@ewt.org.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were made to contact the department and Sivest was informed that Mr Ian Little now handles these issues. Mr Little has been forwarded with all information and will send comments in the next phase.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts thereafter made to contact Mr Little for comment via telephone he informed Sivest that the reports are under review and that he will then send through comments if he has any. Any comments</p>
Mr	Leeuwner	Lourens	Renewable Energy Project Manager	Private Bag X11, MODDERFONTEIN 1609	<a href="mailto:lourensl@ewt.org.za">lourensl@ewt.org.za</a>	

						received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>ESKOM</b>						
Mr	Geeringh	John	Chief Planner	PO Box 1091 JOHANNESBURG 2000	<a href="mailto:GeerinJH@eskom.co.za">GeerinJH@eskom.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Comments received 29 July 2019.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact Eskom for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES (DEFF): BIODIVERSITY CONSERVATION DEPARTMENT</b>						



Mr	Lekota	Seoka		Private Bag X447 PRETORIA 0001	<a href="mailto:slekota@environment.gov.za">slekota@environment.gov.za</a>	<b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Comments received 20 August 2019.
Mr	Rabothata	Mmatlala		Private Bag X447 PRETORIA 0001	<a href="mailto:slekotamrabothata@environment.gov.za">slekotamrabothata@environment.gov.za</a>	<b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>DEPARTMENT OF WATER AND SANITATION (DWS)</b>						
<b><i>Provincial Department - Northern Cape</i></b>						

Ms	Mokhoantle	Lerato	Environmental Officer	28 Central road Beaconsfield Kimberley 8300	<a href="mailto:Mokhoantle@dws.gov.za">Mokhoantle@dws.gov.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact DWS for comment via telephone on the 26 August 2019 to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>DEPARTMENT OF MINERAL RESOURCES (DMR) - NORTHERN CAPE</b>						
Mr	Swart	Pieter	Regional Manager	41 Schmidtsdrift street, Telkom Building, KIMBERLEY, 8300	<a href="mailto:pieter.swart@dmr.gov.za">pieter.swart@dmr.gov.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter</p>

Ms	Mondela	Lungi	Secretary	41 Schmidtsdrift street, Telkom Building, KIMBERLEY, 8300	<a href="mailto:Lungi.Mondela@dmr.gov.za">Lungi.Mondela@dmr.gov.za</a>	made to contact DMR NC for comment via telephone on the 26 August 2019 to no avail.  <b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES (DAFF)</b>						
<b><i>National Department</i></b>						
Ms	Buthlezi	Thoko	AgriLand Liaison Office	Private Bag X120 PRETORIA 0001	<a href="mailto:ThokoB@daff.gov.za">ThokoB@daff.gov.za</a>	<b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via

Ms	Marubini	Mashudu	Delegate of the Minister	Delpen Building Cnr Annie Botha and Union Street Office 270 PRETORIA 0001	<a href="mailto:MashuduMa@daff.gov.za">MashuduMa@daff.gov.za</a>	telephone to no avail.  <b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone but the phone is always engaged. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>Provincial Department- Northern Cape</b>						
Ms	Mans	Jacoline	Chief Forester	Koelenhof, 306 Schroder Street UPINGTON 8800	<a href="mailto:jacolinema@daff.gov.za">jacolinema@daff.gov.za</a>	<b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.  <b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for

						comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>NORTHERN CAPE PROVINCIAL DEPARTMENT OF AGRICULTURE, LAND REFORM &amp; RURAL DEVELOPMENT</b>						
Ms	Bloem	Nomandla	MEC	Private Bag X5018 KIMBERLEY 8300	<a href="mailto:premier@ncpg.gov.za">premier@ncpg.gov.za</a>	<b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.
Mr	Van Heeden	Denver	HOD	Private Bag X6010 KIMBERLEY 8300	<a href="mailto:dvaheeden@ncpg.gov.za">dvaheeden@ncpg.gov.za</a>	<b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to

						contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>NORTHERN CAPE DEPT OF ENVIRONMENT AND NATURE CONSERVATION (NC DENC)</b>						
Mr	Fisher	Brian	Director Environmental Impact Management	Private Bag X86102 KIMBERLEY 8300	<a href="mailto:bfisher@ncpg.gov.za">bfisher@ncpg.gov.za</a>	<b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.
Mr	Mthombeni	Thulani		Private Bag X86102 KIMBERLEY 8300	<a href="mailto:tmtho@webmail.co.za">tmtho@webmail.co.za</a> <a href="mailto:tmthombeni@ncpg.gov.za">tmthombeni@ncpg.gov.za</a>	<b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>NORTHERN CAPE PROVINCIAL DEPT OF SPORT, ARTS &amp; CULTURE: Heritage Resources Unit</b>						

Mr	Lenyibi	Patrick	Manager: Heritage Resources	Private Bag X5004 KIMBERLEY 8300	<a href="mailto:plenyibi@ncpg.gov.za">plenyibi@ncpg.gov.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were made to contact the department and Sivist was informed that the DSR must be sent to Ms A Topham as she is the new person that deals with commenting.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>NORTHERN CAPE DEPARTMENT OF ROADS AND PUBLIC WORKS</b>						

Mr	Roelofse	Jaco	Director: Planning & Design	PO Box 3132 KIMBERLEY 8300	<a href="mailto:roelofse.j@vodamail.co.za">roelofse.j@vodamail.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>SANRAL - WESTERN REGION</b>						



Ms	Abrahams	Nicole	Environmental Coordinator	Private Bag X19 BELLVILLE 7535	<a href="mailto:abrahamsn@nra.co.za">abrahamsn@nra.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>SANRAL - SOUTHERN REGION</b>						

Ms	Songxaba	Nenekazi	Environmental Coordinator	20 Shoreward Drive Bay West Port Elizabeth 6025	<a href="mailto:Songxaban@nra.co.za">Songxaban@nra.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>SAHRA: HEAD OFFICE</b>						

Ms	Higgitt	Natasha	Heritage Officer: Northern Cape	PO Box 4637 CAPE TOWN 8000	<a href="mailto:nhiggitt@sahra.org.za">nhiggitt@sahra.org.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Comments received 23 August 2019.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Comments received on the 20th January 2020.</p>
<b>SQUARE KILOMETRE ARRAY (SKA)</b>						
Dr	Tiplady	Adriaan	Manager: Site Categorisation	PO Box 522 SAXONWOLD 2132	<a href="mailto:atiplady@ska.ac.za">atiplady@ska.ac.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts</p>

						were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>SA CIVIL AVIATION AUTHORITY (SA CAA)</b>						
Ms	Stroh	Lizell	Obstacle Specialist	Private Bag X73 HALFWAY HOUSE 1685	<a href="mailto:strohl@caa.co.za">strohl@caa.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>SENTECH</b>						

Mr	Koegelenberg	Johan	Broadcast Coverage Planner: RF Networks	Private Bag X06 HONEYDEW 2040	<a href="mailto:koegelenbergj@sentech.co.za">koegelenbergj@sentech.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p>
Ms	Pretorius	Alisha		Private Bag X06 HONEYDEW 2040	<a href="mailto:pretoriusa@sentech.co.za">pretoriusa@sentech.co.za</a>	<p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>TRANSNET FREIGHT RAIL</b>						
Mr	Fiff	Sam	Environmental Manager: Freight Rail	PO Box 255 BLOEMFONTEIN 9300	<a href="mailto:sam.fiff@transnet.net">sam.fiff@transnet.net</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail.</p>

						<p><b>EIA Phase</b>  Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>
<b>TELKOM</b>						
Mr	Sithole	Justice		10 Jan Smuts Drive PINELANDS 7404	<a href="mailto:Thurling@telkom.co.za">Thurling@telkom.co.za</a>	<p><b>Scoping Phase</b>  Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were made to contact the department and Sivest was informed that Mr Sithole deals with Northern Cape and will respond to us and send comments in the next phase.</p>
Mr	Bester	Amanda	Wayleave Officer	Private Bag X20700BLOEMFO NTEIN9300	<a href="mailto:WayleaCR@telkom.co.za">WayleaCR@telkom.co.za</a> <a href="mailto:BesterAD@telkom.co.za">BesterAD@telkom.co.za</a>	
Ms	van den Heever	Heleen	Ops Manager Central Region	Private Bag X20700 BLOEMFONTEIN 9300	<a href="mailto:vdheevhd@telkom.co.za">vdheevhd@telkom.co.za</a>	<p><b>EIA Phase</b>  Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to</p>

						contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.
<b>WILDLIFE AND ENVIRONMENT SOCIETY OF SOUTH AFRICA (WESSA)</b>						
Mr	Griffiths	Morgan	Environmental Governance Programme Manager	PO Box 12444, Centrahill PORT ELIZABETH 6006	<a href="mailto:morgan.griffiths@wessa.co.za">morgan.griffiths@wessa.co.za</a>	<p><b>Scoping Phase</b> Access to an electronic copy of the report was emailed on 26 July 2019. Reminder of the DSR comment period ending was sent out on the 19 August 2019. Attempts were made to contact the department to no avail.</p> <p><b>EIA Phase</b> Access to an electronic copy of the report was emailed on 20 March 2019. Reminder of the DEIAr comment period ending was sent out on the 14th and 24th of April 2019. Attempts were thereafter made to contact the department for comment via telephone to no avail. Any comments received after the FEIAr has been submitted will be forwarded to the DEFF.</p>

## 9.9 Meetings

During the 30-day review and comment period of the DEIAr, meetings were undertaken to present the proposed developments to the public and solicit comments and/or concerns<sup>24</sup>. Up to two (2) meetings will be undertaken during this time, namely one (1) Public Meeting and one (1) Focus Group Meeting (FGM). Invitations to these meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&APs and key stakeholders (including affected and adjacent landowners) on the project database. It should however be noted that only one (1) individual attended the Public Meeting (refer to **Appendix 7G** for attendance register) during which an informal discussion was held to provide project information, answer any questions and/or record any comments or concerns. Ward Councilors were however utilised in order to distribute / share information with members of the affected communities. Members of the affected communities are encouraged to contact SiVEST in order to register as an I&AP on the project database and to obtain project information and/or notifications. This database will be shared with the applicant for use when informing members of the affected communities about potential job opportunities, should EA be granted and construction proceed.

Since only one (1) individual attended the Public Meeting (**Appendix 7G**), minutes of the meetings were not compiled and forwarded for review and comment. In addition, as mentioned above, Ward Councilors were utilised in order to distribute / share information with members of the affected communities. Members of the affected communities were encouraged to contact SiVEST in order to register as an I&AP on the project database and to obtain project information and/or notifications.

The primary aim of these meetings was to:

- disseminate information regarding the proposed development to I&APs and key stakeholders;
- provide I&APs and key stakeholders with an opportunity to interact with the EIA team and the representatives from the applicant present;
- supply more information regarding the EIA process;
- answer questions regarding the proposed development and the EIA process; and
- receive input regarding the public participation process and the proposed development.

It should be noted that the Public Meeting and FGM were planned to be held as follows:

**Table 38:** Venues where Public Meeting and FGM were planned to be held

DATE	TIME	MEETING TYPE	VENUE
26 November 2019	2pm	Focus Group Meeting (FGM)	Noupoort Combined School Hall Pretorius Street Noupoort
26 November 2019	4:30pm	Public Meeting	Noupoort Combined School Hall Pretorius Street Noupoort

<sup>24</sup> A single public participation process was undertaken to consider all of the proposed developments which form part of the greater Umsobomvu PV project [i.e. three (3) solar PV energy facility EIAs and three (3) grid connection BAs]



As mentioned, invitations to the above-mentioned meetings were sent out via post (in the form of invitation letters, where required), e-mail and SMS to all registered I&APs and key stakeholders (including affected and adjacent landowners) on the project database (**Appendix 7B**).

The Public Meeting was planned to provide I&APs with information regarding the proposed development, present the EIA phase environmental findings and invite I&APs to raise any further comments and/or concerns that they may have. FGMs are smaller meetings with specific groups or organisations who have similar interests in or concerns about the proposed development.

## 9.10 Comments and Response Report (C&RR)

Issues, comments and concerns raised during the public participation process to date have been captured in the Comments and Response Report (C&RR). The C&RR provides a summary of the comments received and issues raised by I&APs and key stakeholders, as well as the responses provided. This information will be used to feed into the evaluation of environmental and social impacts and has also been taken into consideration when compiling this FEIAR. All comments received to date have been included in the C&RR (**Appendix 7E**).

### 9.10.1 Summary of Comments Received to Date

**Table 39:** Summary of Comments

I&AP / Key Stakeholder / OoS	Date received	Summary of comments
SAHRA	06-06-2019	<p>SAHRA confirmed that they do not have a Notification of Intent to Develop (NID) form. SiVEST were advised to make use of the South African Heritage Resources Information System (SAHRIS) when lodging an application with SAHRA.</p> <p>SiVEST were also advised to contact Ratha Timothy for developments in the Northern Cape Province and contact details for this individual were provided.</p>
SAHRA	07-06-2019	<p>It was confirmed that with regards to the section 38 development application process, only developments that are applied for in terms of section 38(1) of the NRHA require that the relevant Heritage Resources Authority is notified at the earliest phase via a NID document. It was stated that if an application to SAHRA is submitted via SAHRIS, the SAHRIS application acts as a NID document.</p> <p>It was further stated that if the application is being conducted in terms of section 38(8) of the NHRA, then no NID is required as 38(1) does not apply when a 38(8) process is undertaken.</p>

I&AP / Key Stakeholder / OoS	Date received	Summary of comments
		It was confirmed that the Northern Cape Provincial Heritage Resources Authority (NCPHRA) does not have the authority to provide comments on section 38 application, with the exception that if a structure as defined and protected by section 34 is impacted (in which case the NCPHRA must be consulted for comments). SiVEST were advised that all section 38(1) and 38(8) cases for the Northern Cape are processed by SAHRA via SAHRIS.
<b>ESKOM</b>	29-07-2019	<p>Eskom requirements for works at or near Eskom infrastructure was forwarded to SiVEST. Eskom setbacks document that regulates the setback distance for renewable energy plant from Eskom infrastructure was also forwarded to SiVEST.</p> <p>Eskom also requested a KMZ file of the affected properties and proposed Grid connections.</p>
<b>ESKOM</b>	29-07-2019	It was mentioned that Eskom have had interaction with the applicant regarding this application and have a good idea of what is coming in future. Eskom just need to have the actual plans when the applicant is at the point where routes and layouts are determined, so that Eskom can interact if necessary. It was further stated that the applicant is aware of the setbacks issue and Eskom have discussed it with them previously.
<b>SAHRA</b>	31-07-2019	SAHRA requested that SiVEST create application on SAHRIS and upload all documents to the cases.
<b>SAHRA</b>	15-08-2019	SiVEST were informed that the proposed development was not mapped on the SAHRIS Case. SAHRA requested that SiVEST map the proposed development as soon as possible. SiVEST were also asked to change the status of the case to SUBMITTED once the development had been mapped.
<b>SAHRA</b>	15-08-2019	SiVEST were informed that SAHRA do not require the layout to be mapped on the case. Only the application area should be mapped (as already done).
<b>DEFF Biodiversity Conservation Department</b>	20-08-2019	<p>The DEFF's Biodiversity Conservation Department reviewed and evaluated the DSR and its specialist studies. The Department noted that some parts of the site falls within the Critical Biodiversity Areas (CBA 1) which are in a natural state and developments within these areas are not permitted.</p> <p>The Department also provided recommendations regarding what must be submitted as part of the FSR and DEIAr, namely a Plant Rescue and Protection Plan compiled by an ecological specialist.</p>

<b>I&amp;AP / Key Stakeholder / OoS</b>	<b>Date received</b>	<b>Summary of comments</b>
		It was further stated that the major impacts due to the proposed development include habitat destruction and loss of protected plant species. Therefore, in order to achieve the objective of biodiversity conservation the recommendations provided must be adhered to.
<b>Umsobomvu Local Municipality</b>	20-08-2019	SiVEST were informed that the owner / developer must re-apply for the re-zoning of the affected land parcels as zoning not utilized, lapse after a period of 3 years.
<b>SAHRA</b>	23-08-2019	<p>The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit provided interim comments on the DSR and requested that the PIA be revised to provide a map of the identified fossil in relation to the proposed development footprint.</p> <p>It was also requested that when the pending Heritage Impact Assessment report is drafted, the report must clearly separate the results of each development application.</p> <p>SAHRA awaits the revised PIA and pending HIA before further comments are issued. SAHRA also requested that the DEIAr and all appendices be submitted at the start of the Public Consultation period in order for informed comments to be issued.</p>
<b>BirdLife South Africa</b>	28-08-2019	BirdLife South Africa stated that they will not be commenting as an I&AP.
<b>South African Civil Aviation Authority (SA CAA)</b>	09-09-2019	<p>SA CAA advised SiVEST to take note of the Obstacle Application process and procedure published on <a href="http://www.caa.co.za/Pages/Obstacles/Urgent-notice.aspx">http://www.caa.co.za/Pages/Obstacles/Urgent-notice.aspx</a>. The applicant will need to complete this Obstacle Application process.</p> <p>SiVEST were also referred to the "Obstacle Application Process" under "Important Links" on the right-hand side of the page which explains the process. SiVEST were further referred to "Forms" (CA139-27) published under "Important Links".</p> <p>It was stated that when submitting the Obstacle Application Form (CA139-27), all the supporting documents must be attached.</p>
<b>Alfranzo Smit (I&amp;AP)</b>	09-09-2019	Requested to be register as an I&AP. Stated that he his local from the area and a Small, Medium and Micro-Enterprise (SMME) owner.
<b>Veronique Fyfe [I&amp;AP – G7 Renewable</b>	10-09-2019	Requested that G7 be added as an I&AP to the database. It was stated that Ms. Veronique Fyfe could be putdown as the contact person with the email address <a href="mailto:eia@g7energies.com">eia@g7energies.com</a> .

<b>I&amp;AP / Key Stakeholder / OoS</b>	<b>Date received</b>	<b>Summary of comments</b>
<b>Energies (Pty) Ltd]</b>		
<b>Sherina Shaw [I&amp;AP – Leads 2 Business (L2B)]</b>	20-11-2019	Requested a progress update on the proposed project.
<b>Themba Mahenye (Stakeholder / OoS / - Transnet Freight Rail JHB)</b>	25-11-2019	Informed SiVEST that the project related notifications must not be sent to him but rather to Ms.Reyana Sallie and Mr.Ezekiel Monyamane. This was following the notification regarding the start of the DEIAr comment period. The I&AP database ( <b>Appendix 7F</b> ) was updated to include Ms.Reyana Sallie and Mr.Ezekiel Monyamane accordingly.
<b>Veronique Fyfe [I&amp;AP – G7 Renewable Energies (Pty) Ltd]</b>	26-11-2019	Requested that SiVEST share a ‘WeTransfer’ or ‘Dropbox’ folder with her with the documents in, as many of the documents on the SiVEST website returned the failed to download message or had no documents in at all. Also requested that SiVEST share a .kml of the proposed development.  It was subsequently confirmed that Veronique Fyfe received the file from Hlengi already.
<b>SAHRA</b>	09-01-2020	SiVEST were requested to upload the documents to the relevant SAHRIS applications and change the status of the cases to SUBMITTED. This was following the notification regarding the end of the DEIAr comment period.
<b>SAHRA</b>	10-01-2020	SAHRA confirmed that comments will be issued before the 20 <sup>th</sup> of January 2020.
<b>Sherina Shaw [I&amp;AP – Leads 2 Business (L2B)]</b>	13-01-2020	Requested either a link where she could download the DEIArs or whether the DEIAr could be emailed to her. This was following the notification regarding the end of the DEIAr comment period.
<b>Belinda Maliti (I&amp;AP - Inan Inkosi Trading, Noupoot)</b>	17-01-2020	Introduced herself and enquired about potential jobs in the project. Her name and company details were subsequently provided.
<b>SAHRA</b>	20-01-2020	SAHRA provided final comments for the proposed development via a comment letter dated January 20 2020. The following comments were made as a requirement in terms of section 3(4) of the NEMA Regulations and section 38(8) of the NHRA in the format provided in section 38(4) of the NHRA and must be included in the Final EIA and EMPr:

I&AP / Key Stakeholder / OoS	Date received	Summary of comments
		<ul style="list-style-type: none"> <li>▪ 38(4)a – The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit no objections to the proposed development;</li> <li>▪ 38(4)b – The recommendations of the specialists are supported and must be adhered to. No further additional specific conditions are provided for the development;</li> <li>▪ 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</li> <li>▪ 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule; 38(4)d – See section 51(1) of the NHRA;</li> <li>▪ 38(4)e – The following conditions apply with regards to the appointment of specialists: <ul style="list-style-type: none"> <li>i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;</li> </ul> </li> <li>▪ The Final EIA and EMPr must be submitted to SAHRA for record purposes;</li> <li>▪ The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.</li> </ul>
Belinda Maliti (I&AP - Inan)	21-01-2020	Provided her name, contact details and company information in order to be registered as an I&AP on the project database.

I&AP / Key Stakeholder / OoS	Date received	Summary of comments
Inkosi Trading, Noupoot)		SiVEST were thanked for their assistance.
BirdLife South Africa	30-01-2020	BirdLife South Africa stated that they have no comment to make on the proposed project.

A detailed C&RR (including responses to the comments above) is included in **Appendix 7E** of the FEIAr. It should be noted that all comments received throughout the EIA process have been copied verbatim in the attached C&RR. Copies of all comments received throughout the EIA process are included in **Appendix 7D**.

## 10 ENVIRONMENTAL MONITORING AND AUDITING

The EMPr becomes a tool by which compliance on the proposed site can be measured against. In order to utilise this tool, environmental monitoring needs to take place with regular audits against the EMPr to ensure that all aspects are attended to.

Environmental monitoring establishes benchmarks to judge the nature and magnitude of potential environmental and social impacts.

Some of the key parameters for monitoring and auditing of the proposed development include the following *inter alia*:

- Impacts on Terrestrial Ecology;
- Impacts on Avifauna;
- Impacts to Agriculture and Soils;
- Impact on Surface Water;
- Visual impacts on the area imposed by the components of the facility;
- Impacts on heritage resources, including archaeology, paleontology and the cultural landscape;
- Positive and negative socio- economic impacts; and
- Impacts on Traffic.

The overall objective of environmental and social monitoring is to ensure that mitigation measures are implemented and that they are effective. Environmental and social monitoring will also enable responses to new and developing issues of concern. The activities and indicators that have been recommended for monitoring are presented in the EMPr.

The objectives of this EMPr are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;

- To identify measures that could optimise beneficial impacts;
- To create management structures that address the concerns and complaints of I&APs with regards to the proposed development;
- To establish a method of monitoring and auditing environmental management practices during all phases of the proposed development;
- Ensure that the construction and operational phases of the proposed development continues within the principles of Integrated Environmental Management and Environmental Management System (EMS) ISO 14001 Principles;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the proposed development;
- Ensure that the safety recommendations are complied with;
- Propose mechanisms for monitoring compliance with the EMPr and reporting thereon; and
- Specify time periods within which the measures contemplated in the EMPr are implemented, where appropriate.

The EMPr Seeks to highlight the following:

- Avoiding impacts by not performing certain actions;
- Minimising impacts by limiting aspects of an action;
- Rectifying impacts through rehabilitation, restoration, etc. of the affected environment;
- Compensating for impacts by providing substitute resources or environments;
- Minimising impacts by optimising processes, structural elements and other design features;
- Provide on-going monitoring and management of environmental impacts of a development and documenting of any digressions /good performances; and
- The EMPr is a legally binding document that all parties involved in the proposed development must be made aware of.

Environmental monitoring will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented. The contractor shall employ an officer responsible for implementation of social / environmental requirements. This person will maintain regular contact with the local / district Environmental Officers. The contractor and applicant will have a responsibility to ensure that the proposed mitigation measures are properly implemented during the construction phase.

A monitoring programme will be implemented for the duration of the lifecycle of proposed development. This programme will include:

- Regular Audits During the Construction Phase;
- According to the EMPr, EA and permit conditions which will be conducted by the ECO. These audits can be conducted randomly and do not require prior arrangement with the project manager;
- Compilation of an audit report with a rating of the compliance with the EMPr. This report will be submitted to the relevant authorities;
- Annual Audits conducted during the Operational Phase; and
- Undertaken by the ECO.

The environmental monitoring program will operate through the pre-construction, construction, and operation phases. It will consist of a number of activities, each with a specific purpose with key indicators and criteria for significance assessment.

### **10.1 Planning and Design Phase**

- Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- Ensures that adequate regard has been taken of identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where applicable).
- Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.
- Ensures that the best environmental options are selected for the facility.

### **10.2 Construction Phase**

- Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- Minimises the impact on the indigenous natural vegetation, protected tree species, and habitats of ecological value.
- Minimises impacts on fauna using the site.
- Minimises the impact on heritage sites, should they be uncovered.

### **10.3 Operation Phase**

- Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- Enables the operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
- Minimises impacts on fauna.

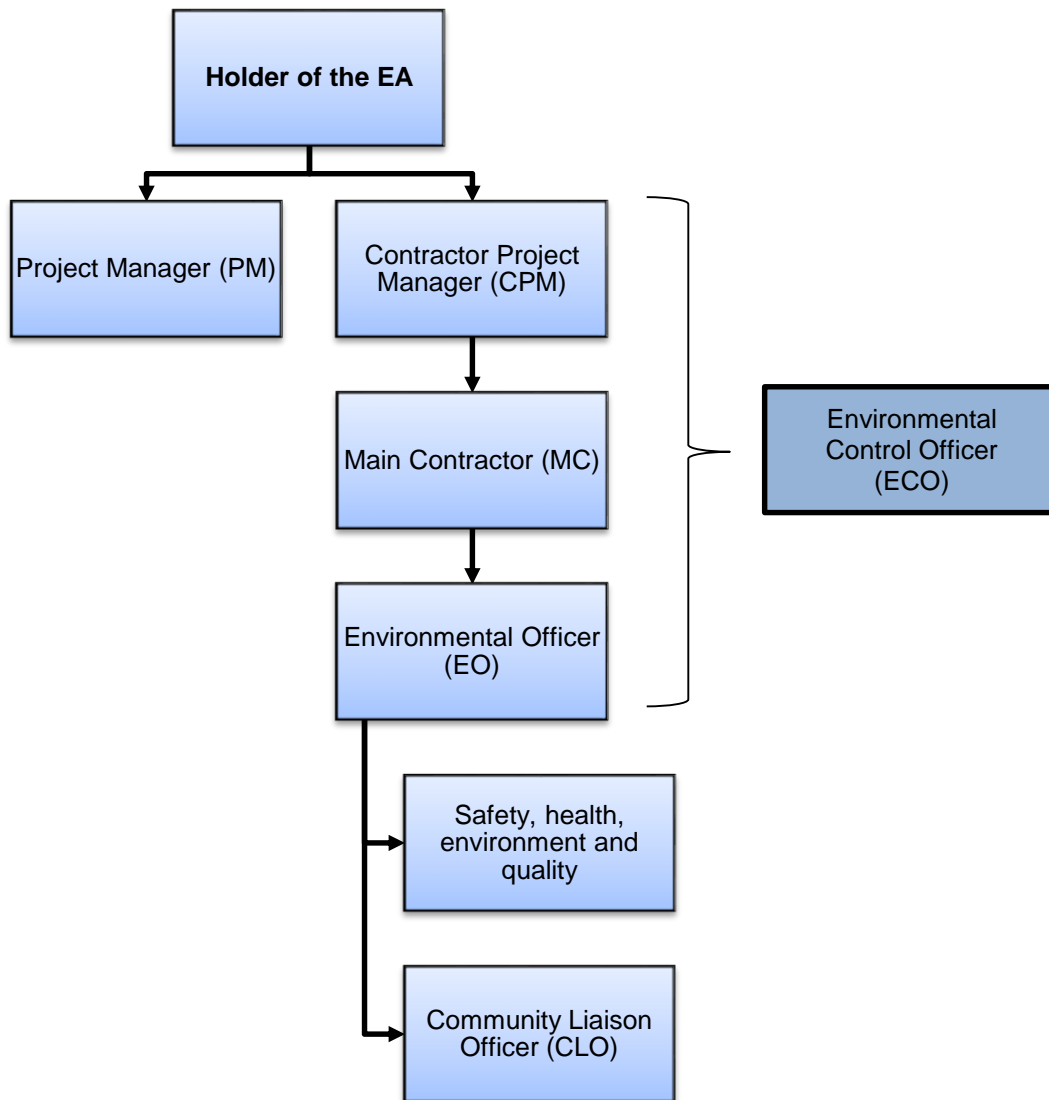


## 10.4 Decommissioning Phase

At the end of the operational phase of the proposed development, the proposed development might need to be decommissioned. This would include the decommissioning of the medium voltage lines connecting the PV array areas to the substations as well as the overhead lines connecting the substations to the grid (i.e. the 132kV overhead power lines) which are associated with the proposed development. Should the proposed development need to be decommissioned, the applicant will rehabilitate the project site as per the requirements in the NEMA Regulations, following the decommissioning of the project site. The aim of the decommissioning phase would be to return the site to its original pre-construction condition. In the unlikely event that decommissioning is required (i.e. PPA not renewed, facility becoming outdated or the land being required for other purposes), the decommissioning phase will be undertaken in line with the EMPr and the requirements in the NEMA Regulations, and the site will be rehabilitated to its original pre-construction condition.

Majority of the components of the solar PV energy facility are considered to be reusable or recyclable. In the event of the proposed development being decommissioned, the components will be reused, recycled or disposed of (where possible) in accordance with the relevant regulatory requirements. Certain PV components may also be traded or sold as there is an active second-hand market for certain PV components. Alternatively, in the event that sale is not possible, certain PV components may be used as scrap metal. It must be noted that the decommissioning phase of the proposed development will also create skilled and unskilled employment opportunities.

Monitoring should be undertaken at a number of levels (**Figure 56**). Firstly, it should be undertaken by the Contractor at work sites during construction, under the direction and guidance of the Supervision Consultant who is responsible for reporting the monitoring to the implementing agencies. It is not the Contractor's responsibility to monitor land acquisition and compensation issues. It is recommended that the Contractor employ local full time qualified environmental inspectors for the duration of the Contract. The Supervision Consultant should include the services of an independent environmental and monitoring specialist on a part time basis as part of their team.



**Figure 56:** Organogram indicating the organisational structure

Environmental monitoring is also an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measure, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time.

Periodic on-going monitoring will be required during the life of the proposed development and the level can be determined once the proposed development is operational.

The Draft EMP is included in **Appendix 8**.

## 11 ASSESSMENT IN TERMS OF EQUATOR PRINCIPLES

The Equator Principles (EPs) are a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. Several banks, exchanges and organisations worldwide have adopted the EPs as requirements to be undertaken for project funding

on application and approval. Furthermore, certain funding institutions have not formally adopted the EPs, but require clients to be compliant with them in order to qualify for loans. The EPs are summarised below:

#### **Principle 1: Review and Categorisation**

When a project is proposed for financing, the Equator Principles Funding Institution (“EPFI”) will categorise the project based on the magnitude of its potential environmental and social impacts and risks.

#### **Principle 2: Environmental and Social Assessment**

For each project assessed as being either Category A or Category B, the client / borrower must conduct a Social and Environmental Assessment (“Assessment”) process to address the relevant impacts and risks of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

#### **Principle 3: Applicable Environmental and Social Standards**

The Assessment will refer to the applicable IFC Performance Standards and applicable Industry Specific Environmental, Health, and Safety (EHS) Guidelines.

#### **Principle 4: Environmental and Social Management System and Equator Principles Action Plan**

The client / borrower must prepare an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) must be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where applicable standards are not met to the EPFI’s satisfaction, the client and the EPFI will agree to an Equator Principles Action Plan to outline gaps and commitments.

#### **Principle 5: Stakeholder Engagement**

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an on-going process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to the risks and impacts of the Project; the Project’s phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups.

#### **Principle 6: Grievance Mechanism**

The EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the project’s environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies.

### **Principle 7: Independent Review**

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower must review the Assessment, AP and consultation process documentation in order to assist the EPFIs due diligence and assess EPs compliance.

### **Principle 8: Covenants**

An important strength of the EPs is the incorporation of covenants linked to compliance. For all projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. For Category A and B projects, the client / borrower will covenant in financing documentation:

- To comply with the ESMPs and EPs AP (where applicable) during the construction and operation of the Project in all material respects;
- To provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third-party experts, that i) document compliance with the ESMPs and EPs AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and
- To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

### **Principle 9: Independent Monitoring and Reporting**

To ensure on-going monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower to retain qualified and experienced external experts to verify its monitoring information, which would be shared with EPFIs.

### **Principle 10: Reporting and Transparency**

For all Category A and, as appropriate, Category B Projects:

- The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.
- The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO2 equivalent annually.

**Although this report is not written in terms of the EPs, it fully acknowledges that EPs will need to be complied with should funding for the proposed development be required from a development financial institution.** In general, the following documentation will need to be considered in that regard:

- The “Equator Principles” 2013
- International Finance Corporations Performance Standards on Social and Environment, IFC, January 2012, namely:

- Performance Standard 1: Social and Environmental Assessment and Management Systems
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Pollution Prevention and Abatement
- Performance Standard 4: Community Health, Safety and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage
- International Finance Corporation – World Bank Guidelines, General EHS Guidelines 2007.

EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. These EHS Guidelines are applied as required by the World Bank’s respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

- The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

### 11.1 Assessment Results

This section details the current compliance level with which the proposed development meets with the EPs and the related Performance Standards which are outlined below.

The coding key is as follows:

Compliance Level			
Clear			
Not assessed / determined	Not compliant	Partially compliant	Compliant

**Table 40:** Compliance level of proposed development in terms of EPs and related performance standards.

Principles	Compliance Level	Reference
<b>General, Performance Standard 1 Environmental &amp; Social Reporting</b>		
1. Baseline Information		Refer to <b>section 2</b> – Technical Details and <b>section 6</b> – Description of the receiving environment
2. Alternatives (Assessment of alternatives)		Refer to <b>section 8</b>
3. Impacts and risks		Refer to <b>section 7</b>

Principles	Compliance Level	Reference
4. Global impacts	N/A	N/A
5. Legal requirements		Refer to <b>section 4</b> for legal requirements and guidelines
6. Transboundary	N/A	N/A
7. Disadvantaged / vulnerable groups		Addressed in <b>Appendix 6F</b> as part of the Social Impact Assessment. This has also been addressed as part of the EMPr ( <b>Appendix 8</b> )
8. Third party		Refer to <b>section 1.1</b> and <b>Appendix 6F</b>
9. Mitigation measures		Addressed in <b>section 7</b> , as well as part of specialist assessments ( <b>Appendix 6</b> ). Also addressed as part of the EMPr ( <b>Appendix 8</b> )
10. Documentation process		Refer to <b>section 1</b> , <b>section 4</b> and <b>section 9</b>
11. Action Plans		Partially addressed in <b>section 11</b> . No major Action Plans required as mostly generic mitigation measures have been required
12. Organisational capacity		Refer to <b>Appendix 1</b>
13. Training		Refer to <b>Appendix 1</b>
14. Grievance mechanism		Refer to <b>Appendix 1</b> . The applicant will commit to full compliance with this standard when financial closure has been reached. The applicant is fully aware of the implications of this standard and this information will be made available in due course as part of the development planning for the project.
15. Report content		Refer to <b>section 1</b>
<b>Performance Standard 2, Labour &amp; Working Conditions</b>		
1. Human Resource Policy		Refer to <b>Appendix 1</b> . The applicant will commit to full compliance with this standard when financial closure has been reached. The applicant is fully aware of the implications of this standard and this information will be made available in due course as part of the development planning for the project.
2. Working relationship		Refer to <b>Appendix 1</b>
3. Working conditions with and terms of employment		Refer to <b>Appendix 1</b>

Principles	Compliance Level	Reference
4. Workers organisation		Refer to <b>Appendix 1</b>
5. Non-discrimination and equal opportunities		Refer to <b>Appendix 1</b> . Partly addressed in <b>section 7</b> as part of the Social Impact Assessment ( <b>Appendix 6F</b> ). This issue has also been addressed as part of the EMPr ( <b>Appendix 8</b> )
6. Grievance mechanism		Refer to <b>Appendix 1</b> . Addressed as part of the EMPr ( <b>Appendix 8</b> )
7. Occupational Health and Safety		Refer to <b>Appendix 1</b> . Addressed as part of the EMPr ( <b>Appendix 8</b> )
8. Non-employee workers		Refer to <b>Appendix 1</b> . Addressed as part of the EMPr ( <b>Appendix 8</b> )
9. Supply Chain		Refer to <b>Appendix 1</b> . Addressed as part of the EMPr ( <b>Appendix 8</b> )
10. Labour Assessment Component of a Social and Environmental Assessment		Refer to <b>Appendix 1</b> . Addressed as part of the EMPr ( <b>Appendix 8</b> )
<b>Performance Standard 3, Pollution</b>		
1. Pollution Prevention, Resource Conservation and Energy Efficiency		Refer to EMPr in <b>Appendix 8</b>
2. Wastes		Refer to EMPr in <b>Appendix 8</b>
3. Hazardous material		Refer to EMPr in <b>Appendix 8</b>
4. Dangerous substances		Refer to EMPr in <b>Appendix 8</b>
5. Emergency preparedness and response		Refer to EMPr in <b>Appendix 8</b> . The applicant will commit to full compliance with this standard when financial closure has been reached. The applicant is fully aware of the implications of this standard and this information will be made available in due course as part of the development planning for the project
6. Technical guidance – ambient considerations		Refer to <b>Appendix 1</b>
7. Greenhouse gas emissions		N/A. No greenhouse gas emissions will result from the proposed development apart from the manufacturing of the solar PV components and limited emissions during construction phase
<b>Performance Standard 4, Health &amp; Safety</b>		
1. Hazardous materials safety		Refer to EMPr in <b>Appendix 8</b>

Principles	Compliance Level	Reference
2. Environmental and natural resource issues		Refer to <b>section 7</b>
3. Emergency preparedness and response		Refer to EMPr in <b>Appendix 8</b> . The applicant will commit to full compliance with this standard when financial closure has been reached. The applicant is fully aware of the implications of this standard and this information will be made available in due course as part of the development planning for the project
<b>Performance Standard 5, Land Acquisition</b>		Refer to <b>section 5</b> and <b>section 6</b> . Project needs and desirability and the background of the receiving environment are discussed
<b>Performance Standard 6, Biodiversity</b>		Refer to <b>section 6.7</b> and <b>section 7.2.2</b> which summarises the findings from the Terrestrial Ecology Impact Assessment
<b>Performance Standard 7, Indigenous People</b>		Refer to <b>section 9</b> describing public participation. In addition, <b>section 6.15</b> details the findings of the Social Impact Assessment
<b>Performance Standard 8, Cultural Heritage</b>		Refer to <b>section 6.13</b> and <b>section 7.2.7</b>

It is important to note that some of the issues listed per performance standard in the table above will only be addressed during the pre-construction and construction phase of the proposed development.

## 12 CONCLUSIONS AND RECOMMENDATIONS

Wonderheuvél Solar Power is proposing to construct the Wonderheuvél Solar PV Energy Facility and associated infrastructure near Noupoort in the Northern Cape Province of South Africa. The proposed development will have a maximum generation capacity of up to approximately 480MW. The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid.

The EIA for the proposed development has been conducted in accordance with the EIA Regulations, 2014 (as amended), promulgated in terms of Chapter 5 of NEMA. A preferred layout has been identified which is less environmentally sensitive and will result in the least environmental impact.

Various feasible layout alternatives which include alternatives for laydown / staging areas and O&M buildings were identified and assessed during the EIA phase (**section 8.2**). In addition, two (2) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have been comparatively assessed by the respective specialists and have



informed the location of the substation sites which are being proposed as part of this EIA application<sup>25</sup>. The preliminary PV development area was also comparatively assessed with the proposed PV development area, which was informed by the identified sensitive areas, during the scoping phase in order to assess and confirm that it would be 'preferred' from an environmental perspective (**section 8.1**). All alternatives were assessed against the 'no-go' alternative (i.e. *status quo*).

The majority of the specialist assessments undertaken as part of the EIA process were conducted at an EIA level and as such included ground-truthing verification of the proposed development site. The Avifauna study has been undertaken over a six (6)-month period, while an intensive Terrestrial Ecology study was undertaken to further identify and define environmental constraints within the proposed development footprint. Based on the findings of the specialist assessments, the proposed PV development area that was presented in the FSR was refined to further avoid identified environmental sensitivities (where required) and informed the location of the layout alternatives which were investigated and assessed in the EIA phase.

Detailed mitigation and management measures have been developed and have been put forward in the EMPr (**Appendix 8**). Should this proposed development receive a positive environmental authorisation (EA), the EMPr will guide the project proponent and appointed contractor(s) through the final design, construction and operational phases of the proposed development.

The findings of the specialist assessments undertaken as part of this EIA provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed development. The findings conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding. Areas of special concern have however been identified which will require site-specific mitigation measures to reduce impacts. These are included within the EMPr to ensure that these areas receive special attention.

It was determined during the EIA that the proposed development will result in limited potential negative impacts and certain positive impacts. A preferred layout has been identified which is less environmentally sensitive and will result in the least environmental impact.

A detailed public participation process is being followed during the EIA process which conforms to the public consultation requirements as stipulated in the EIA Regulations, 2014 (as amended). In addition, all issues raised by I&APs and key stakeholders will be captured in the FEIAR and where possible, mitigation measures provided in the EMPr to address these concerns.

As sustainable development requires all relevant factors to be considered, including the principles contained in section 2 of NEMA, the FEIAR has strived to demonstrate that where impacts were identified, these have been considered in the determination of the preferred layout.

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<sup>25</sup> Although the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) will be comparatively assessed as part of the associated electrical infrastructure BA (part of a separate process **DEFF Ref No.:** [14/12/16/3/3/1/2134](#)), the alternatives which have been chosen as 'preferred' by the respective specialists will inform the location of the substation sites proposed as part of this EIA application. As such, the results of the comparative assessment of grid connection infrastructure alternatives have been provided in this report to provide information regarding the substations proposed as part of this EIA application

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in **Table 41** below.

## 12.1 Summary of Findings

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in the table below.

**Table 41:** Summary of environmental issues identified in Specialist Studies

<p>Terrestrial Ecology</p>	<p>There are various Acts that limit development or require permits before development can proceed. The most important of these are permits required in terms of protected species that could potentially occur on-site, including the National Environmental Management: Biodiversity Act, the Northern Cape Nature Conservation Act and the National Forests Act.</p> <p>Details of the description of the ecological receiving environment are summarised as follows:</p> <ol style="list-style-type: none"> <li>1. The study area is situated in an area that is on the boundary between relatively flat plains and a low mountain range with moderately to steeply sloping topography. Habitat on-site is in a largely natural state and is in a rural environment. There is very little transformation or serious degradation on site.</li> <li>2. There are two (2) regional vegetation types occurring in the project study area, Eastern Upper Karoo (most of the area), and Besemkaree Koppies Shrubland (mountain areas). There are three (3) other national vegetation types in the vicinity, namely Southern Karoo Riviere, Tarkastad Montane Shrubland and Karoo Escarpment Grassland. Floristic components of all five (5) of these units occur in the study area, even though they are not all mapped as occurring within the study area. All these vegetation types are listed in the scientific literature as Least Threatened and none are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).</li> <li>3. All habitat in the Northern Cape part of the study area is mapped as “Critical Biodiversity Area 2” (CBA2) or “Critical Biodiversity Area 1” (CBA1) in the Provincial Conservation Plan and there are also patches mapped as “Ecological Support Area” (ESA). The remaining natural vegetation on-site on the Northern Cape side, therefore, has high value for the conservation of vegetation in the Province according to the broad-scale CBA maps.</li> <li>4. Habitats on-site were divided into five (5) units, namely “Mountain Vegetation”, “Lowland Plains Vegetation”, “Low Ridges and Koppies”, “Broad Drainage Areas” and “Mountain Stream”. The vegetation on the plains on-site was found to be a karroid dwarf shrubland that resembles the description for Eastern Upper Karoo, but the mountain vegetation was a mixed grassy shrubland that appears to be a floristic mix of Besemkaree Koppies Shrubland and Karoo Escarpment Grassland. The mountain vegetation has the highest</li> </ol>
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local diversity and greatest variation in species composition. A map of natural habitats of the study area was produced by mapping from aerial imagery, based on information collected in the field.

5. There are no plant species occurring on-site or likely to occur on-site that are protected according to the National Environmental Management: Biodiversity Act (Act No 10. of 2004) (NEM:BA).
6. There are a number of plant species occurring on-site that are protected according to the Northern Cape Nature Conservation Act (Act 9 of 2009). It is likely that additional protected species occur there that were not observed during the field survey. None of these are of conservation concern, but a permit is required from the Provincial authorities to destroy them. These are listed in the text in the body of this report.
7. There are no protected tree species that are likely to occur in the study area.
8. A total of 79 mammal species have a geographical distribution that includes the general study area in which the sites are found. Of the species currently listed as threatened or protected (see Appendix 5 of Terrestrial Ecology Impact Assessment Report for list of protected species), the following are considered to have a very high, high or medium probability of occurring on-site, based on habitat suitability and evidence collected in the field: the Black-footed Cat (Vulnerable), the Cape Clawless Otter (Near Threatened), the South African Hedgehog (Near Threatened), Grey Rhebok (Near Threatened), White-tailed Rat (Vulnerable), and the Spectacled Dormouse (Near Threatened). There is strong evidence to suggest that the Black-footed Cat and the Cape Clawless Otter both definitely occur on-site.
9. The study area contains habitat that is suitable for a small number of frog species. One (1) protected frog species, the Giant Bullfrog, could potentially occur on-site.
10. A total of 55 reptile species have a geographical distribution that includes the general study area in which the sites are found. No reptile species of conservation concern could potentially occur in the study area.
11. A preliminary sensitivity map of the study area was produced that identifies areas of higher sensitivity that should be taken into account during activities on-site. This includes drainage areas and associated wetland-related habitat, low ridges, parts of the mountain area, and CBA1 and CBA2 areas.

The preliminary assessment of impacts indicates that all impacts are of low significance or can be reduced to low significance with mitigation, with the exception of loss of natural vegetation, for which the impact remains of medium significance after mitigation.

Proposed mitigation measures include the following: shifting infrastructure positions to avoid sensitive habitats, select infrastructure options that cause the least amount of damage to natural habitats, cross watercourses at right angles, install appropriate structures at watercourse crossings to minimise impacts on these systems, minimise vegetation clearing and disturbance, formalise a rehabilitation programme, undertaking a pre-construction botanical walk-through

	<p>survey of the footprint of the selected options, obtaining permits for any protected species that may be affected, undertaking a search and rescue of plants for which it is appropriate to rescue, compile an alien plant management plan and undertaking regular monitoring.</p> <p>The report concludes that there are some sensitivities in the study area related to natural habitat and to individual species, but that these can be minimised or avoided with the application of appropriate mitigation or management measures. There will be residual impacts, primarily on natural habitat, but the amount of habitat that will be lost to the project is insignificant compared to the area in hectares of the regional vegetation type that occurs on-site and therefore the residual impacts are considered acceptable, on condition local sensitivities of biodiversity importance are avoided. On this basis, it is recommended that the project be authorised.</p>
Avifauna	<p>The proposed PV facility will have some pre-mitigation impacts on avifauna at a site and local level which will range from Medium to Low.</p> <p>The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as Medium. This impact can be partially reversed through mitigation, but it will remain at a Medium level, after mitigation. The envisaged impacts in the operational phase, i.e. mortalities due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low pre-mitigation and could be further reduced with appropriate mitigation. The impact of displacement due to disturbance during the decommissioning phase is rated as Medium, and it will remain at a Medium level after mitigation. The cumulative impact of the proposed PV facilities within a 35km radius is rated as Low, both per- and post-mitigation.</p> <p>The impact of displacement due to disturbance associated with the construction of the proposed substations, is assessed to be Medium and can be mitigated to a Low level. The potential for displacement due to habitat destruction associated with the construction of the substations is rated as Low and could be further reduced with appropriate mitigation. The impact of displacement due to disturbance associated with the decommissioning of the proposed substations is assessed to be Medium and can be mitigated to a Low level.</p> <p><b>IMPACT STATEMENT</b></p> <p>From an avifaunal impact perspective, there is no objection to the proposed development of the PV facility, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase.</p>
Surface Water	<p>Findings were based on the method for delineating wetlands and riparian habitats as per the <b>DWAF (2005 &amp; 2008)</b> guidelines. At a broad level, the study site is located within the Orange Catchment. More specifically, the study area is situated</p>

within the quaternary catchments D32B & D32C. The fieldwork assessment found that there are no wetlands on the study site. However, a number of watercourses, both perennial and non-perennial, were identified throughout the entire study area.

In terms of the Ecological Condition of the non-perennial, and perennial watercourses, Ecological Condition was assessed to be a class C – Moderately Modified systems.

The Environmental Importance and Sensitivity Class for the watercourses was determined. The results showed that the EISC for the watercourses were categorised as a Class B (High). The classification of high EISC was primarily due to the condition of the watercourses assessed, as well as the presence of endangered species.

The buffer zone determination for the watercourses took into account the type of the proposed development, potential impacts, condition of the habitat as well as other characteristics of the watercourse. As a result, the following buffer zones were assessed and are to be implemented as far as possible:

- Construction Phase Buffer: 15m
- Operation Phase Buffer: 15m

Foreseen potential negative impacts related to the proposed development were identified and assessed. The potential construction-related impacts included impacts to watercourses (-20 low pre- and -8 low post-mitigation impact rating), hydrology of the watercourses (-20 low pre- and -9 low post-mitigation impact rating) and water quality impacts (-39 medium pre- and -9 low post-mitigation impact rating). The operational impacts identified included impacts to the hydrology of the watercourse (-36 medium pre- and -18 low post-mitigation impact rating). Overall, all impacts were assessed to be low, post-implementation of mitigation measures.

In terms of potentially applicable environmental and water-related legislation, listed activities were identified to be triggered in terms of NEMA (1998) and the EIA Regulations (2014, as amended) from a surface water perspective. With respect to the NWA (1998), water uses (c) and (i) were identified as being potentially applicable. However, the application of the risk assessment matrix protocol as per **Government Notice 509 of 2016 (No. 40229)** was undertaken, the findings show that the risk of potential impacts on the watercourse was assessed to be in the LOW-risk class. Where risks were identified, a number of control measures have been stipulated which will assist in decreasing the level of risk to an even lower level. In accordance with the implementation of control measures, all potential risks are classed as LOW. Therefore, registration for General Authorisation (GA) can be undertaken where required and agreed upon with the Department of Water and Sanitation (DWS).

	<p>The decision on whether the proposed development is to proceed will rest on environmental and water governmental departments whom will need to make a trade-off between meeting the conservation targets of the province or meeting the energy demands of the country. However, it is the opinion of the specialist that the proposed development may proceed where the relevant control measures and mitigation measures stipulated are implemented.</p> <p>There are a number of recommendations to be implemented for the proposed development. These include the following:</p> <ul style="list-style-type: none"> <li>▪ A stormwater management plan for all phases of the proposed development is required to be compiled and implemented which accounts for control of increased run-off, erosion and sedimentation; and</li> <li>▪ An Alien Eradication and Removal Programme is to be compiled and implemented for the duration of the proposed development.</li> </ul> <p>Based on the findings above, with the implementation of the control and mitigation measures stipulated, it is the opinion of the specialist that the proposed development may proceed.</p>
Agricultural and Soils (Desktop)	<p>It should be noted that a field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development (see section 4.1 of the scoping phase Agricultural and Soils Impact Assessment Report).</p> <p>The key findings of the Agricultural and Soils Impact Assessment are provided below:</p> <ul style="list-style-type: none"> <li>▪ The proposed project area is dominated by shallow, loamy sands on underlying rock or less commonly clay. Dominant soil forms are Swartland, Hutton, Mispah, and Valsrivier.</li> <li>▪ The major limitations to agriculture are the limited climatic moisture availability (low rainfall), the rugged terrain and the shallow, rocky soils.</li> <li>▪ As a result of these limitations, the agricultural use of the study area is limited to low-intensity grazing only, except for some isolated patches of irrigation land.</li> <li>▪ The proposed project area is classified with land capability evaluation values between 1 (very low) and 7 (low to moderate), with 6 being most predominant.</li> <li>▪ The significance of all agricultural impacts is kept low by the limited agricultural potential of the land.</li> <li>▪ The only parts of the study area that do not have low sensitivity are the small patches of irrigation. These are considered no-go areas for any footprint of development that will exclude cultivation.</li> <li>▪ Two (2) potential negative impacts of the development on agricultural resources and productivity were identified. These are: <ul style="list-style-type: none"> <li>○ Loss of agricultural land use; and</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Soil erosion and degradation.</li> <li>▪ One (1) potential positive impact of the development on agricultural resources and productivity was identified as: <ul style="list-style-type: none"> <li>○ Increased financial security of farming operations through rental income</li> </ul> </li> <li>▪ Soil erosion and degradation was assessed as having medium significance before and after mitigation. The other two (2) impacts were assessed as having low significance before and after mitigation.</li> <li>▪ The recommended mitigation measures are for implementation of an effective system of stormwater run-off control; maintenance of vegetation cover; and to strip, stockpile and re-spread topsoil.</li> <li>▪ There is no material difference between the significance of impacts of any of the proposed project alternatives. All proposed alternatives have an equal impact.</li> <li>▪ Due to the low agricultural potential of the site, and the consequent low to medium, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised.</li> </ul>
Visual	<p>Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, solar PV development would alter the visual character and contrast significantly with the typical land-use and/or pattern and form of human elements present across the broader study area. The level of contrast will however be reduced by the presence of the N10 national route and existing high voltage power lines in the northern sector of the study area.</p> <p>The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of twenty-six (26) potentially sensitive receptors were identified in the combined study area, three (3) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from the proposed PV facility. Although the N10 receptor road traverses the study area, motorists travelling along this route are only expected to experience moderate impacts from the proposed Wonderheuvel solar PV facility.</p> <p>An overall impact rating was also conducted in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed Wonderheuvel solar PV facility would be of low significance during both construction and decommissioning phases.</p>

	<p>During operation, visual impacts from the solar PV facility would be of medium significance with relatively few mitigation measures available to reduce the visual impact.</p> <p>Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the Wonderheuvvel solar PV project, it was determined that only one (1) of these would have any significant impact on the landscape within the visual assessment zone, namely Umsobomvu WEF. This proposed WEF, in conjunction with the proposed solar PV facility, will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, paroral landscape, thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.</p> <p>No fatal flaws were identified for any of the proposed site alternatives for laydown areas and O&amp;M buildings. A summary of the preference rating is provided below:</p> <ul style="list-style-type: none"> <li>▪ Wonderheuvvel Solar PV Facility: No preference was determined for any of the laydown area and O&amp;M building site options and all but two (2) sites were found to be favourable. The remaining options, Site Option 6 and Site Option 8 were found to be the least preferred due to their proximity to potentially sensitive receptors.</li> </ul> <p>It is the specialist's opinion that the visual impacts associated with the proposed Wonderheuvvel solar PV facility are of moderate significance. Given the low level of human habitation and the relative absence of sensitive receptors, the project is deemed acceptable from a visual perspective and the EA should be granted for the relevant EIA application. The specialist is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.</p>
Heritage (Desktop)	<p>The Heritage Impact Assessment (HIA) consisted of a scoping phase during which background information and landscape analysis was done to determine the heritage resources that can potentially occur within the study area. This was followed up with fieldwork by a team of archaeologist and a palaeontologist with the aim of identifying heritage resources in the development footprint areas and to make recommendations on the management of these resources and the possible chance finds during construction activities.</p> <p>The field work identified a total of ten (10) areas of heritage significance. Adjustments to the project layouts based on the various specialist input resulted in the total avoidance of three (3) heritage areas that was excluded from the reporting. The remaining seven (7) sites consist of three (3) large, low to medium</p>



	<p>density scatters of later stone age sites (UMS005,008 and 009). UMS004, 006 and 007 are all- round stone packed enclosure.</p> <p>UMS010 was identified as a fossil find spot and a 50-meter buffer around the fossil bearing material must be implemented. Any construction in the demarcated area must be monitored by a palaeontologist.</p> <p>The impact rating on the heritage resources indicated that pre-mitigation a negative high impact is projected but with the implementation of the recommended management measures this impact rating will be reduced to low negative.</p> <p>The results of the comparative assessment of the alternatives provided found there to be no preference between the layout alternatives. This is due to the fact that no heritage issues were identified for any of the footprints. The palaeontological sensitive area at UMS010 is the only heritage resources that influences the Options assessment, but those options affected is still favourable with the implementation of the recommended management measures.</p> <p>It is the specialist's considered opinion, based on the current data available, that with the consideration of the position of heritage sensitivities during the layout design and the implementation of the proposed management measures, the project will have an acceptable low impact on heritage resources and can continue.</p>
Palaeontology	<p>The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a Palaeontological Impact Assessment (PIA) is key to detect the presence of fossil material within the planned development footprint. This PIA is thus necessary to evaluate the effect of the construction on the palaeontological resources.</p> <p>These proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction. According to the PalaeoMap of South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Tarkastad and Adelaide Subgroups has a Very High Palaeontological Sensitivity, while that of the Quaternary superficial deposits of the Central interior is high and the Karoo dolerite (igneous rocks) is insignificant and rated as zero.</p> <p>A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24<sup>th</sup> – 28<sup>th</sup> January 2019. Elsewhere in the Karoo</p>

	<p>Basin numerous fossils have been uncovered in these geological sediments but only two (2) sites on koppies with fossiliferous outcrops were identified. Although these localities do not currently fall in the proposed development sites, these fossiliferous sites have been identified as Highly Sensitive and No-go areas. It is recommended that a 50m buffer will be placed around these areas. If construction is a necessity in these sensitive areas, it is recommended that the fossils will be collected by a professional palaeontologist. Preceding excavation of any fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.</p> <p>With the above-mentioned in consideration, the proposed development, as well as all alternatives have a similar geology and therefore there is no preferences on the grounds of palaeontological fossil heritage for any specific layout among the different options under consideration. As impacts on fossil heritage usually only occur during the excavation phase, no further impacts on fossil heritage are expected during the operation and decommissioning phases of the Solar Energy Facility (SEF).</p> <p>The impact of development on fossil heritage are usually negative but it could also have a positive impact due to the discovery of newly uncovered fossil material that would have been unavailable for scientific research. The SEF could also provide a long-term benefit to the country by supplying renewable energy to the electricity grid.</p> <p>In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, in situ) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: <a href="http://www.sahra.org.za">www.sahra.org.za</a>) so that correct mitigation (e.g. recording and collection) can be carried out by a palaeontologist.</p> <p>It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. From a Palaeontological Heritage view there is no fatal flaws in the proposed SEF development project. However, it is recommended that the mitigation measures are included in the Environmental Management Programme (EMPr) and fully implemented.</p>
Social	<p><b><u>APPROACH TO STUDY</u></b></p> <p>Data was gathered using the following techniques.</p> <p><b>Collection of data</b></p> <p>Data was gathered through:</p>

	<ul style="list-style-type: none"> <li>▪ The project description prepared by the project proponent.</li> <li>▪ Statistics South Africa, Census 2011 and other relevant demographic data generated by Stats SA such as the Quarterly Labour Force Survey and Mid-year population estimates.</li> <li>▪ Discussions with the project proponents and Environmental Impact Assessment Consultants.</li> <li>▪ A literature review of various documents such as the relevant Municipal Integrated Development Plans (IDPs) and other specialist reports and documents.</li> <li>▪ A broader literature scan.</li> </ul> <p><b>Impact assessment technique</b></p> <p>The assessment technique used to evaluate the social impacts was provided by SiVEST Environmental Division and is attached in Appendix 1 of the Social Impact Assessment Report (<b>Appendix 6F</b>).</p> <p><b><u>IMPACTS IDENTIFIED</u></b></p> <p>The impacts are assessed in respect of the following phases of the project:</p> <ul style="list-style-type: none"> <li>▪ Planning and design</li> <li>▪ Construction</li> <li>▪ Operational</li> <li>▪ Decommissioning, and</li> <li>▪ The ‘no go’ option.</li> </ul> <p><b>Construction phase</b></p> <p>Most of the impacts discussed above apply over the short-term to the construction phase of the project and include:</p> <ul style="list-style-type: none"> <li>▪ Annoyance, dust and noise;</li> <li>▪ Increase in crime;</li> <li>▪ Increased risk of HIV infections;</li> <li>▪ Influx of construction workers and job seekers;</li> <li>▪ Hazard exposure;</li> <li>▪ Disruption of daily living patterns;</li> <li>▪ Disruptions to social and community infrastructure;</li> <li>▪ Job creation and skills development; and</li> <li>▪ Socio-economic stimulation.</li> </ul> <p><b>Operational phase</b></p> <p>The social impacts that apply to the operational phase of the project are:</p> <ul style="list-style-type: none"> <li>▪ Transformation of the sense of place; and</li> <li>▪ Economic. <ul style="list-style-type: none"> <li>○ Job creation and skills development.</li> <li>○ Socio-economic stimulation.</li> </ul> </li> </ul> <p><b>Decommissioning</b></p>
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If the project were to be completely decommissioned the major social impacts likely to be associated with this would be the loss of jobs and revenue stream that stimulated the local economy and flowed into the municipal coffers.

#### **'No Go' Alternative**

The 'no go' option would mean that the social environment is not affected as the status quo would remain. On a negative front it would also mean that all the positive aspects associated with the project would not materialise. Considering that Eskom's coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not at a global level.

#### **Cumulative Impacts**

In this regard the following cumulative impacts are addressed below:

- Risk of HIV
- Sense of place
- Service supplies and infrastructure, and
- The economic benefit.

No fatal flaws associated with the cumulative impacts are evident at a social level. The findings support the recommendations of the various reports undertaken for the different renewable energy projects in the region that, on an overall basis, the social benefits of renewable energy projects outweigh the negative benefits and that the negative social impacts can be mitigated.

#### **COMPARATIVE ASSESSMENT OF LAYOUT ALTERNATIVES**

As no social preference emerged in respect of any of the alternatives, the other specialist reports were perused to establish if there was any preference that would have an influence on the social. Based on this analysis the following preferences were identified and supported on a social basis:

- Laydown Area and O&M Building Site Option 1 = Preferred
- Laydown Area and O&M Building Site Option 2 = Preferred
- Laydown Area and O&M Building Site Option 3 = Preferred
- Laydown Area and O&M Building Site Option 4 = Preferred
- Laydown Area and O&M Building Site Option 5 = Least Preferred
- Laydown Area and O&M Building Site Option 6 = Least Preferred
- Laydown Area and O&M Building Site Option 7 = Least Preferred
- Laydown Area and O&M Building Site Option 8 = Least Preferred

#### **CONCLUSION AND RECOMMENDATIONS**

In assessing the social impact of the solar PV Facility, it was found that in respect of the energy needs of the country and South Africa's need to reduce its carbon emissions that the project fits with national, provincial and municipal policy.

Regarding the social impacts associated with the project it was found that most apply over the short term to the construction phase of the project. Of these impacts

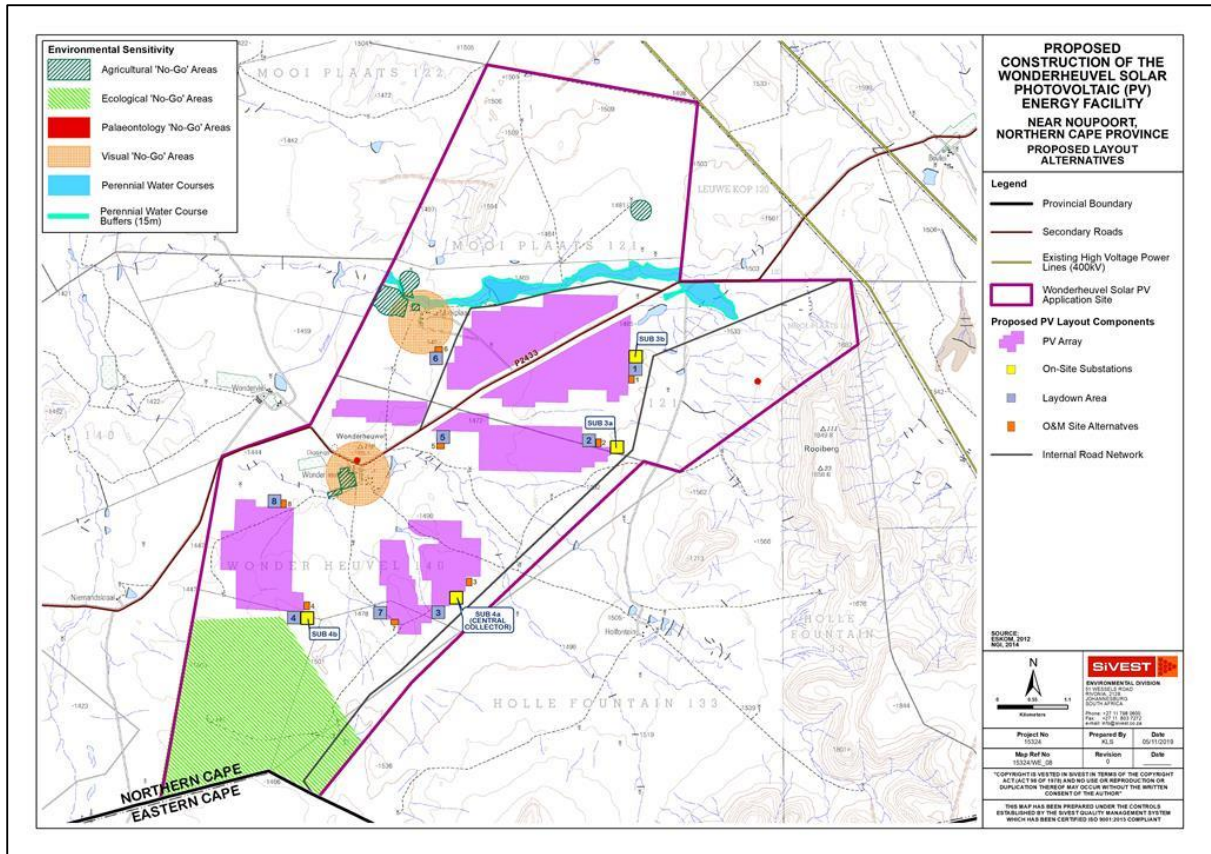
	<p>all can be mitigated to within acceptable ranges and there are no fatal flaws associated with the construction or operation of the project.</p> <p>On a cumulative basis it is evident that the cumulative impacts associated with changes to the social environment of the region are more significant than those attached to the project in isolation. On a negative front there are two (2) issues associated with developments in the region that are of most concern. The first of these issues is the change to the sense of place of an area that was once considered a pristine region of South Africa. The second is the potential, through an influx of labour and an increase in transportation to constructions sites, of the risk for the prevalence of HIV to rise in an area that has a relatively low HIV prevalence rate. In this regard it is important that the relevant authorities recognise these issues and find ways of mitigating them to ensure that they do not undermine the benefit that renewable energy projects bring, both to the region as well as to the country as a whole. These issues are beyond a project-specific basis and as such will need to be addressed at a higher level.</p> <p><b>Impact Statement</b></p> <p>The project site and surrounding areas are sparsely populated with the agricultural potential of the area being low. Accordingly, the negative social impacts associated with the proposed Wonderheuvvel solar PV facility are of low to moderate significance with most occurring over the short term construction phase. The project has a positive element which outweighs the negative in that it will contribute towards the supply of renewable energy into a grid system heavily reliant on coal- powered energy generation. In this sense the project forms part of a national effort to reduce South Africa's carbon emissions and thus carries with it a significant social benefit and is thus supported and should proceed.</p> <p>As the area is sparsely populated and the negative social impacts associated with the solar PV facility is of moderate significance, it is most unlikely that any further social study will be necessary. This will, however, be dependent on the outcome of the public participation process which may result in a need to update the current report by incorporating the comments recorded and updating the social impacts accordingly.</p>
Geotechnical (Desktop)	<p>The desktop geotechnical assessment did not identify any fatal flaws that, from a geological and geotechnical perspective, would prevent the construction of the proposed Wonderheuvvel Solar PV Energy Facility.</p> <p>The potential impacts the project may have on the geology, relate to soils that could be impacted by the construction activities. There may be a potential for soil erosion, due to removal of vegetation and exposure of the soils to the elements, during construction. The impacts were found to be of "<b>negative low impact</b>".</p> <p>Various options were studied for the PV facility. The geological impacts will be similar. Due the very similar bedrock geology, similar geotechnical conditions are expected across all options.</p>

	<p>From a geological and geotechnical perspective, based on the minimal negative impacts on the geology and soils and the recommendations for mitigation measures, it is recommended that the project receives the 'go-ahead' from the Competent Authority.</p>
<p>Transportation</p>	<p>The following conclusions were made:</p> <ul style="list-style-type: none"> <li>▪ During the construction phase an additional <math>\pm 43</math> vehicles trips will commute at the peak of the construction phase, transporting staff and labour. Typically, these trips will be in the morning between 6:00 – 7:00 and in the afternoons between 16:00 – 17:00.</li> <li>▪ The heavy construction vehicles and deliveries will contribute an additional <math>\pm 25</math> vehicle trips / day, typically occurring during the 'weekday midday' which will equate to <math>\pm 4</math> vehicle trips / hour. These additional vehicles will only contribute a small percentage to the existing road network.</li> <li>▪ The abnormal loads on this development will be negligible and therefore will have no major impact.</li> <li>▪ The cumulative impact of the area confirms that no significance rating change will be experienced during the construction period of the PV development.</li> <li>▪ The existing road network can accommodate the proposed development; however, the recommendations below must be considered to mitigate any possible negative impacts.</li> <li>▪ We recommend a Traffic Management Plan be completed prior to construction in order to form part of the Final Environmental Management Programme (EMPr). The plan must include inter alia the following; <ul style="list-style-type: none"> <li>○ The review of all intersections and routes prior to the project commencing in order to accommodate construction vehicles and staff commuting.</li> <li>○ Further discussions with the SANRAL and the respective transport department on access points and route requirements.</li> <li>○ The upgrades of intersections and the installation of road traffic signage as per the SARTSM (South African Road Traffic Sign Manual).</li> <li>○ The implementation of pedestrian safety initiatives</li> <li>○ The implementation of a road maintenance plan under the auspices of the respective transport department.</li> </ul> </li> <li>▪ We recommended that one (1) access point from the N10 freeway be used for the proposed facility to reduce the impact to the area. This access point is located at Km19.92 on section N10-5 and the appropriate axillary lanes and speed reduction measures are to be implemented subsequent to discussions with SANRAL. This study and a revised study, with the all the renewable parties involved in the area at the time, must be submitted to SANRAL and more specifically Ms. Colene Runkel (021 957 4613) for review and comments.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Development of access points to the PV facility is as per the recommendations in section 9 of the specialist Transportation report (<b>Appendix 6I</b>).</li> <li>▪ The appropriate load permits be obtained from the Department of Transport prior to construction (if required).</li> <li>▪ This assessment is limited to the impacts the development traffic will have on the network and not on the wider impacts known as background traffic. Background traffic includes the cumulative impacts other developments will have on the environment if their programs overlap. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods. We therefore recommend that this study be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.</li> </ul>
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All of the environmental aspects above were thoroughly investigated as part the EIA process and the specialists did not recommend any further studies and/or investigations to be undertaken. However, from a transportation perspective it was recommended that a detailed Traffic Impact Study, which takes into account actual traffic counts undertaken during the peak periods, be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.

The results of the specialist studies have indicated that preferred layout alternatives contain no fatal flaws as a result of the proposed development. Additionally, the specialists comparatively assessed the alternatives as provided in **Figure 57** below.



**Figure 57:** Proposed PV array areas and layout alternatives for associated infrastructure in relation to environmental sensitive areas

The results of the comparative assessment of alternatives are summarised in **Table 42** and **Table 43** below. In addition, the preferred site layout in relation to the sensitive areas identified by the specialists is indicated in **Figure 58** below.

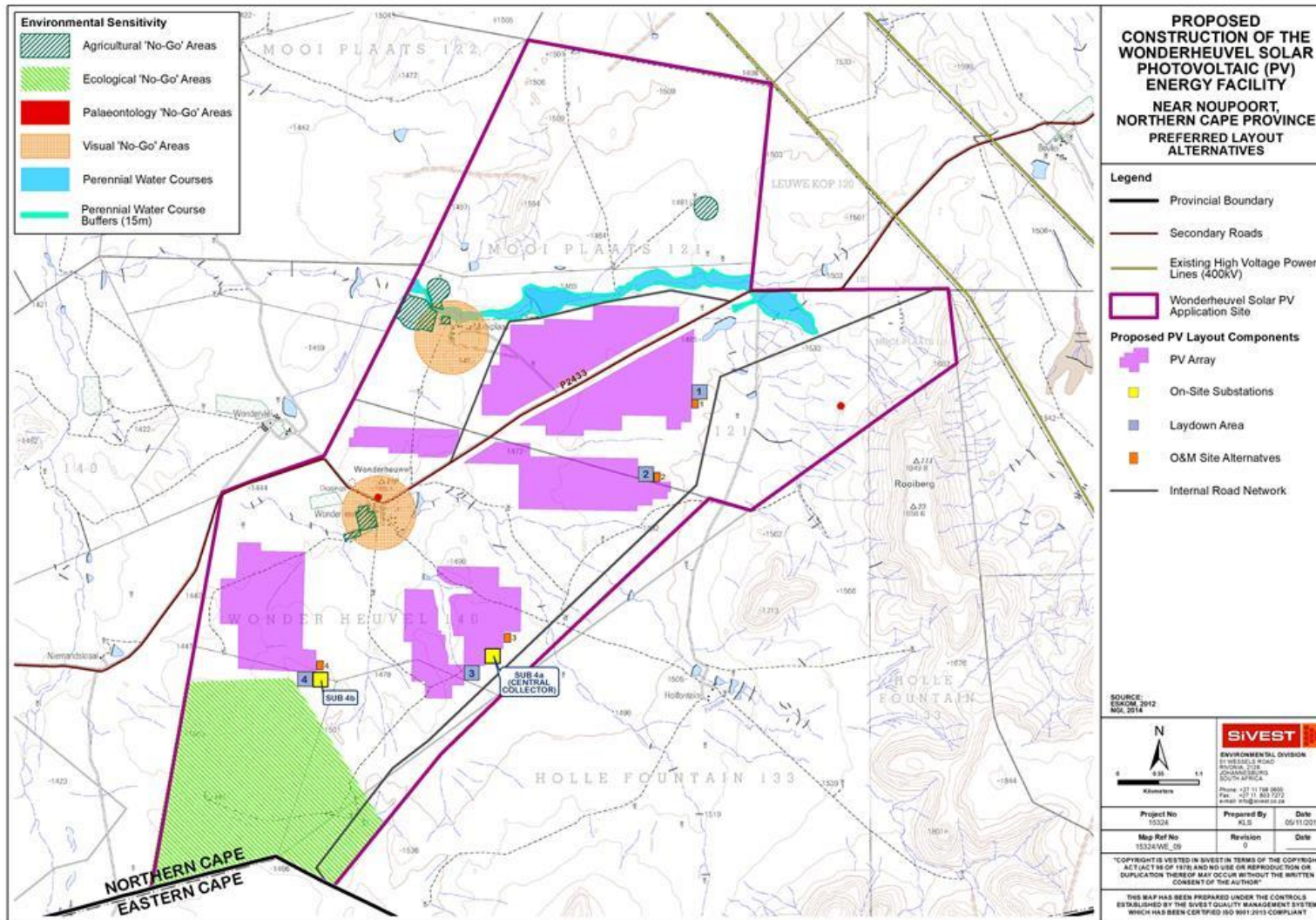


**Table 42:** Summary of comparative assessment of layout alternatives for Wonderheuveld Solar PV Energy Facility

ALTERNATIVE	ENVIRONMENTAL ASPECT											FATAL FLAW (YES / NO)	PREFERRED (YES / NO)	
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage				
<b>TEMPORARY LAYDOWN / STAGING AREA AND OPERATION &amp; MAINTENANCE (O&amp;M) BUILDING SITE ALTERNATIVES</b>														
Laydown and Building Option 1	Favourable	Preferred	Favourable	Favourable	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES	
Laydown and Building Option 2	Favourable	Preferred	Favourable	Favourable	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES	
Laydown and Building Option 3	Least Preferred	Preferred	Favourable	Preferred	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES	
Laydown and Building Option 4	Favourable	Preferred	Favourable	Preferred	No Preference	Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	YES	
Laydown and Building Option 5	Favourable	Least Preferred	Favourable	Favourable	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	NO	
Laydown and Building Option 6	Favourable	Least Preferred	Least Preferred	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	NO	
Laydown and Building Option 7	Least Preferred	Least Preferred	Favourable	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	NO	
Laydown and Building Option 8	Favourable	Least Preferred	Least Preferred	Preferred	No Preference	Least Preferred	No Preference	No Preference	No Preference	No Preference	No Preference	NO	NO	

**Table 43:** Summary of comparative assessment of layout alternatives for Wonderheuveld Grid Connection Infrastructure

ALTERNATIVE	ENVIRONMENTAL ASPECT										FATAL FLAW (YES / NO)	PREFERRED (YES / NO)
	Terrestrial Ecology	Surface Water	Visual	Geotechnical	Avifauna	Social	Transportation	Palaeontology	Agricultural and Soils	Heritage		
<b>GRID CONNECTION INFRASTRUCTURE (132kV POWER LINE AND ON-SITE AND COLLECTOR SUBSTATIONS) ALTERNATIVES</b>												
Grid Connection Option 1a	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1b	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1c	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 1d	Least Preferred	Least Preferred	Least Preferred	Favourable	Least Preferred	Least Preferred	No Preference	No Preference	No Preference	Favourable	NO	NO
Grid Connection Option 2a	Preferred	Favourable	Favourable	Preferred	Preferred	Favourable	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>
Grid Connection Option 2b	Preferred	Favourable	Favourable	Preferred	Preferred	Favourable	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>
Grid Connection Option 3	Preferred	Preferred	Favourable	Preferred	Preferred	Preferred	No Preference	No Preference	No Preference	Favourable	NO	<b>YES</b>



**Figure 58:** Preferred site layout in relation to identified environmental sensitive areas

It is the opinion of the EAP that the information and data provided in this FEIAR is sufficient to enable the DEFF to consider all identified potentially significant impacts and to make an informed decision on the application. Furthermore, it is the opinion of the EAP that based on the findings of the EIA that the proposed development should be granted an EA and allowed to proceed, provided the following conditions are adhered to:

- All feasible and practical mitigation measures recommended by the various specialists must be incorporated into the Final Environmental Management Programme (EMPr) and implemented; and
- Where applicable, monitoring should be undertaken to evaluate the success of the mitigation measures recommended by the various specialists.

SiVEST, as the EAP, is therefore of the view that:

- Preferred Laydown Area, O&M Building and Substation sites (on-site and collector) have been identified which are less environmentally sensitive compared to the other sites considered during the EIA phase; and
- Through the implementation of mitigation measures, together with adequate compliance monitoring, auditing and enforcement thereof by the appointed Environmental Control Officer (ECO) as well as the competent authority, the potential detrimental impacts associated with the proposed development can be mitigated to acceptable levels.

The date on which the activity will commence cannot be determined at this stage as they are based on the timeframes dictated by the REIPPPP bid windows. The date of the next round of bid submissions has not yet been announced. The construction of the Wonderheuvel Solar PV Energy Facility and associated infrastructure is dependent on being selected as a preferred bidder or entering into an offtake agreement with a different energy consumer. The project will therefore require an environmental authorisation of at least ten (10) years.

It is trusted that the FEIAR provides adequate information to the I&APs to provide input and for the competent authority to make an informed decision regarding the proposed development.

## **12.2 Decision-Making Authority Consultation**

The stages at which the competent authority were consulted are as follows:

- Submission of Application for EA;
- Submission of DSR for comment;
- Submission of FSR and EIA Plan of Study (PoS) for comment;
- Submission of DEIAR for comment; and
- Submission of FEIAR for decision making.

Additional consultation may occur with the DEFF after the EA has been issued, should the need arise.

### **12.3 Cumulative Impact Assessment**

The potential cumulative impact of the proposed solar PV energy facility in combination with other renewable energy facilities within a 35km radius from the application site of the proposed solar PV energy facility has been identified and assessed per environmental aspect in **section 7.3**. In addition, mitigation measures were identified to address the cumulative impacts, where possible. The specialist reports included a detailed cumulative impact assessment, including a review of other specialist studies conducted for other renewable energy developments within a 35km radius of the application site of the proposed solar PV energy facility. The recommendations contained in the specialist reports reflect the mitigation measures provided in the FEIAr and EMPr. Cumulative impacts are also rated as part of the impact rating system and have been used to determine the significance of the impacts.

### **12.4 Environmental Management Programme (EMPr)**

In accordance with Appendix 4 of the EIA Regulations, 2014 (as amended), a draft EMPr has been included within the FEIAr (**Appendix 8**). The EMPr includes the mitigation measures formulated by the various specialists and all information as required in Appendix 4 of the EIA Regulations, 2014 (as amended). The Draft EMPr can be found in **Appendix 8**. A Final EMPr will be submitted to the DEFF for review and approval prior to construction commencing.

## **13 WAY FORWARD**

The DEIAr was made available to the public for a period of 30 days from 22 November 2019 until 13 January 2020 (excluding public holidays and DEFF's closure period). Hard copies of the DEIAr were made available at a public venue (namely the Noupoot Public Library) and an electronic copy was also made available on SiVEST's website (see **section 9.7**). Comments on the DEIAr which were received were collated into an updated C&RR that included a response from the EAP. The FEIAr, including an updated C&RR, and EMPr was subsequently submitted to the DEFF on 13 February 2020. Once the DEFF have acknowledged receipt of the FEIAr, the DEFF will have 107 days to either grant or refuse the EA for the proposed development.

Once a decision regarding the EA has been received from the DEFF, it will be made available to the public and all registered I&APs, stakeholders and OoS / authorities will be notified accordingly and provided details regarding the appeal process. The EIA process will thus come to an end once appeals (if any) have been dealt with adequately and the appeal process closes.

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