

# DRAFT ENVIRONMENTAL IMPACT REPORT

For the proposed Kappa Photovoltaic Energy Facility near Christiana, North West Province



DEA Reference: 14/12/16/3/3/2/670

Prepared by



**ENVIRONAMICS**

PO Box 6484, Baillie Park, 2526. Tel: 018 299 1523, Fax 086 762 8336  
e-mail: [Carli.Steenkamp@nwu.ac.za](mailto:Carli.Steenkamp@nwu.ac.za)

## PROJECT DETAIL

DEA Reference No. : 14/12/16/3/3/2/670

Project Title : Proposed Kappa Photovoltaic Solar Energy Facility near Christiana, North West Province

Authors : Ms. Carli Steenkamp &  
Ms. Marelie Griesel

Applicant : Kappa Solar Power Plant (Pty) Ltd.

Report Status : Draft Environmental Impact Report (EIR)

Submission date : 8 October 2014

**When used as a reference this report should be cited as:** Environamics (2014) Draft EIR: Proposed Kappa Photovoltaic Solar facility and associated infrastructure near Christiana, North West Province.

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## GLOSSARY OF TERMS AND ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
DEA	Department of Environmental Affairs
DoE	Department of Energy
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
GNR	Government Notice Regulation.
I&AP	Interested and affected party.
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
LTLM	Lekwa-Teemane Local Municipality
Mitigate	Activities designed to compensate for unavoidable environmental damage.
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
NERSA	National Energy Regulator of South Africa
NWA	National Water Act No. 36 of 1998
NWP	North West Province
PPP	Public Participation Process
PV	Photovoltaic
REIPPP	Renewable Energy IPP Procurement Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SPP	Solar Power Plant

## CONTEXT FOR THE PROPOSED PROJECT

According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fueled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development. The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of the national Department of Energy's (DoE) long-term strategic planning and research process.

The primary rationale for the proposed solar photovoltaic (PV) facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by DoE (Integrated Resource Plan 2010-2030). In terms of the Integrated Resource Plan (IRP), approximately 8.4GW of the renewable energy capacity planned to be installed will be generated from PV technologies over the next twenty years.

To contribute towards this target and to stimulate the renewable energy industry in South Africa, the need to establish an appropriate market mechanism was identified, and the Renewable Energy IPP Procurement (REIPPP) process was announced in August 2012, with the intention of DoE to purchase 3,750MW of renewable energy from IPPs to be delivered to the national grid by end of 2016 under a 20 year Power Purchase Agreement to be signed with Eskom. The establishment of the REIPPP process in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector in the country, the region and internationally, and promote competitiveness for renewable energy with conventional energies in the medium- and long-term.

In response to the above, Kappa Solar Power Plant (Pty) Ltd. is proposing the development of a photovoltaic solar facility and associated infrastructure for the purpose of commercial electricity generation on an identified site located near Christiana in the North West Province (refer to Figure 1 for the locality map). From a regional site selection perspective, this region is preferred for solar energy development due to its global horizontal irradiation value of 1760kWh/m<sup>2</sup>/annum.



## EXECUTIVE SUMMARY

The Lekwa-Teemane Local Municipality's Integrated Development Plan (IDP, 2012/17) reveals the following primary development objectives based on social and economic development challenges of the province: stimulate economic development; develop and enhance infrastructure for economic growth and social development; reduce poverty through human and social development; ensure a safe and secure environment for all people of the province and promote effective and efficient governance and administration. In order to give effect to these developmental objectives, the Province has identified the following issues that need to be addressed: to achieve an annual economic growth rate at least equal to the national average economic growth rate; reduce unemployment; to reduce the number of households living in poverty; to provide free basic services to all households and to provide adequate infrastructure for economic growth and development. The IDP encourages sustainable development and seeks economic approaches that benefit the local environment and quality of life, rather than undermining it. Sustainable development provides a framework within which communities can use resources efficiently, create efficient infrastructure, protect and enhance their quality of life, and create new businesses to strengthen their economies (IDP 2012/17).

In response to the above Kappa Solar Power Plant intends to develop an 84MW photovoltaic solar facility and associated infrastructure on the Remaining Extent of the farm Honesty 43, Registration Division HN, North West situated within the Lekwa-Teemane Local Municipality area of jurisdiction. The town of Christiana is located approximately 24km north east of the proposed development (refer to Figure 1 and 2 for the locality and regional map). The total footprint of the project will approximately be 285 hectares (including supporting infrastructure on site). The site was identified as being highly desirable due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. agricultural potential, geology and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation), as well as site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase).

The Environmental Impact Assessment (EIA) Regulations, 2010 (Regulation 543) determine that an environmental authorisation is required for certain listed activities, which might have detrimental effects on the environment. The following activities have been identified with special reference to the proposed development and are listed in the EIA Regulations:

- Activity 10(i) (Regulation 544): *"The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 1 (Regulation 545): *"The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."*
- Activity 15 (Regulation 545): *"Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more."*
- Activity 14(a)(i) (Regulation 546): *"The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation- (a) North West Province (i) All areas outside urban areas."*

Being listed under Listing Notice 1, 2, and 3 (Regulation 544, 545, and 546) implies that the development is considered as potentially having a significant impact on the environment. Subsequently a 'thorough assessment process' is required as described in Regulations 26-35. Environamics has been appointed as the independent consultant to undertake the EIA on Kappa Solar Power Plant's behalf.

Regulation 28 of the EIA Regulations requires that a scoping report must contain all the information that is necessary for a proper understanding of the nature of issues identified during scoping. The potential positive and negative impacts associated with the proposed activity have been identified. The potentially most significant environmental impacts associated with the development are briefly summarized below:

Impacts during the construction phase:

During the construction phase minor negative impacts are foreseen over the short term. The latter refers to a period of months. The potentially most significant impacts relate to the generation of waste, impacts on heritage objects, visual intrusions, and socio-economic impacts such as the impact of construction workers on local communities, increased risk of veld fires, and the provision of temporary employment.

Impacts during the operational phase:

During the operational phase the study area will serve as a solar PV energy facility and the potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with soil erosion, increase in storm water runoff, the increased consumption of water, visual impacts, and the leakage of hazardous materials. The provision of sustainable services delivery also needs to be confirmed. The operational phase will have positive impacts through the provision of employment opportunities for its duration, the generation of additional electricity and the establishment of a community trust.

Impacts during the decommissioning phase:

The physical environment will benefit from the closure of the solar facility since the site will be restored to its natural state. The decommissioning phase will result in the loss of permanent employment. However, skilled staff will be eminently employable and a number of temporary jobs will also be created in the process. The potential negative impacts relating to the generation of waste will also require certain management measures.

Cumulative impacts:

Cumulative impacts could arise if other similar projects are constructed in the area. According to the Department's database one other solar PV plant has been proposed within the Lekwa-Teemane Local Municipality, namely the Solar Energy Facility on Hartebeestpan Farm, Christiana PV 2 (75mw) (DEA/EIA/0000924/2012) and the proposed Delta Photovoltaic Solar Energy Facility near Bloemhof, North West Province (DEA Reference: 14/12/16/3/3/2/669). The potential for cumulative impacts may therefore exist.

The Solar Energy Facility on Hartebeestpan Farm (DEA/EIA/0000924/2012) is located approximately 8.5km north east of the site. Therefore, the operation of the PV plant and ancillary infrastructure may become a cumulative visual impact in light of the potential occurrence of other such infrastructure in this region. The cumulative impact occurs in terms of the visual perception of

the site as a whole. The Visual Impact Assessment (Sandham, 2014:23) confirmed that given the relatively flat topography of this region, the entire site is usually visible only from a greater distance, i.e. more than 2 km, and will then impact largely on motorists.

The Delta project is located more than 65km from the Kappa site – refer to figure 9. Given the location of the sites relative to each other and the distances between them the potential for cumulative impacts associated with combined visibility (whether two or more solar facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more solar facilities along a single journey, e.g. road or walking trail) is judged to be very low. The potential cumulative impacts were considered during the significance rating of the potential impacts (refer to Section 5.12 of this report). The significance of these were considered to be of low to medium negative (-) significance and low to medium positive (+), without mitigation. Therefore the cumulative impacts associated with the proposed development are not considered to be significant.

Regulation 31 of the EIA Regulations determine that an Environmental Impact Report (EIR) be prepared and submitted for the proposed activity after the competent authority approves the final scoping report. Since the Department of Environmental affairs approved the final scoping report on 7 October 2014, this EIR will evaluate and rate each identified impact, and identify mitigation measures which may be required. This EIR also contains information that is necessary for the competent authority to consider the application and to reach a decision contemplated in Regulation 35.

# 1. INTRODUCTION

This section aims to introduce the Environmental Impact Report (EIR) and specifically to address the following requirements of the regulations:

**31(2)** An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include –

(a) details of –

(i) the EAP who compiled the report; and

(ii) the expertise of the EAP to carry out an Environmental Impact Assessment.

## 1.1 Legal mandate and purpose of the report

Regulations No. 543, 544 and 545 (of 18 June 2010) promulgated in terms of Section 24(5), 24(M) and 44 of the National Environmental Management Act, (107 of 1998) determine that an Environmental Impact Assessment (EIA) process should be followed for certain listed activities, which might have a detrimental effect on the environment. According to the DEAT 2006 general guidelines the main objectives of the Regulations are: *“... to establish the procedures that must be followed in consideration, investigation, and assessment and reporting of the activities that have been identified. The purpose of these procedures is to provide the competent authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an acceptable degree are not authorized, and that activities which are authorized are undertaken in such a manner that the environmental impacts are managed to acceptable levels.”*

The EIA Regulations No. 544, 545 and 546 outline the activities for which EIA should apply. The following activities with special reference to the proposed activity are listed in the EIA Regulations:

**Table 1.1:** Listed activities <sup>1</sup>

Relevant notice:	Activity No (s)	Description of each listed activity as per project description:
GNR. 544, 18 June 2010	Activity 10(i)	<ul style="list-style-type: none"> <li>• <i>“The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.”</i></li> <li>• Activity 10(i) is triggered since the proposed photovoltaic solar facility will transmit and distribute electricity of more than 33 kilovolts outside an urban area.</li> </ul>
GNR. 545, 18 June 2010	Activities 1	<ul style="list-style-type: none"> <li>• <i>“The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.”</i></li> </ul>

<sup>1</sup> Please refer to Table 5.2 for a detailed description of the relevant aspects of the development that will apply to each specific listed activity.

		<ul style="list-style-type: none"> <li>Activity 1 is triggered since the proposed photovoltaic solar facility will generate 84 megawatts electricity.</li> </ul>
GNR. 545, 18 June 2010	Activities 15	<ul style="list-style-type: none"> <li><i>“Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more.”</i></li> <li>Activity 15 is triggered since the proposed photovoltaic solar facility is located outside an urban area and will result in the transformation of approximately 285 hectares of undeveloped, vacant or derelict land.</li> </ul>
GNR. 546, 18 June 2010	Activities 14(a)(i)	<ul style="list-style-type: none"> <li><i>“The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation- (a) North West Province (i) All areas outside urban areas.”</i></li> <li>In terms of vegetation type the site falls within the Kimberley Thornveld vegetation type, is described by Mucina and Rutherford (2006) as ‘least threatened’. The region is characterised by plains often slightly irregular with well-developed tree layer with <i>Acacia erioloba</i>, <i>A. tortilis</i>, <i>A. karroo</i> and <i>Boscia albitrunca</i> and well-developed shrub layer with occasional dense stands of <i>Tarchonanthus camphoratus</i> and <i>A. mellifera</i>. The ecological fauna and flora habitat survey (refer to Appendix D3) confirmed that <i>“at present visible ecological disturbance at the site are reflected by conspicuous abundance of pioneer plant species and bare areas at hitherto cultivated fields at the central and eastern parts of the site. However at the western parts of the site disturbances appear to be moderate.”</i> Therefore the proposed activity will result in the clearance of 5 hectares or more of indigenous vegetation outside an urban area.</li> </ul>

Being listed under Listing Notice 1, 2, and 3 (Regulation 544, 545, and 546) implies that the proposed activity is considered as potentially having a significant impact on the environment. Subsequently a ‘thorough assessment process’ is required as described in Regulations 26-35.

According to the DEA 2012 Integrated Environmental Management Guideline Series (Guideline 5) ‘Companion to the Environmental Impact Assessment Regulations, 2010’ the *“EIA phase assesses issues identified in the scoping phase and includes an environmental management programme (EMPr). The EMPr provides information on the proposed activity and the manner in which potential impacts will be minimized or mitigated”*. The EIA report must comply with regulation 31(2) and include inter alia:

- A description and comparative assessment of all alternatives identified;
- A description of all environmental issues identified as well as significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- A reasoned opinion as to whether the activity should, or should not be authorised;
- An environmental impact statement; and
- A draft Environmental Management Programme (EMPr).

This report is the Draft Environmental Impact Report (EIR) that was submitted to the Department of Environmental Affairs. According to Regulation 543 all registered I&APs and relevant State Departments must be allowed the opportunity to review the draft and final reports. The draft EIR will be made available to registered I&APs and all relevant State Departments. They will be requested to provide written comments on the draft EIR within 40 days of receiving the report. All issues identified during this review period will be documented and compiled into a Comments and Response Report as part of the Final EIR.

## 1.2 Details of the environmental assessment practitioner (EAP)

Environamics was appointed by the applicant as the independent EAP to conduct the EIA and prepare all required reports. All correspondence to the EAP can be directed to the following contact details:

Contact person: Carli Steenkamp  
 Postal Address: PO Box 6484, Baillie Park, 2526  
 Telephone: 018 299 1523 (w) 086 762 8336 (f)  
 Electronic Mail: [Carli.Steenkamp@nwu.ac.za](mailto:Carli.Steenkamp@nwu.ac.za)

Regulation 17 determines that an independent and suitably qualified EAP should conduct the EIA. In terms of the independent status of the EAP a declaration was submitted as part of the application form. The expertise of the EAP responsible for conducting the EIA is summarized in a curriculum vitae included as Appendix G7 to this report.

## 1.3 Details of specialists

The following specialists are also involved with the project:

### Heritage Impact Assessment -

Contact person: Mr. J.A. van Schalkwyk  
 Postal Address: 62 Coetzer Avenue, Monument Park, Pretoria, 0181  
 Telephone: 012 347 7270 (w) 086 611 3902 (f) 076 790 6777 (Cell)  
 Email: [jvchalkwyk@mweb.co.za](mailto:jvchalkwyk@mweb.co.za)

### Ecological Fauna and Flora Habitat Survey and brief Wetland Assessment - Anthene Ecological CC

Contact person: Mr R. Terblanche  
 Postal Address: Private Bag X6001, Potchefstroom, 2520  
 Telephone: 082 614 6684 (Cell)  
 Electronic Mail: [Reinierf.terblanche@gmail.com](mailto:Reinierf.terblanche@gmail.com)

#### Visual Impact Assessment -

Contact person: Dr. L. A. Sandham  
Postal Address: 27 Aalwyn Street, Potchefstroom, 2531  
Telephone: 018-290-6791 (w) 086-622-0152 (f) 083 320 3576  
Email: [Luke.sandham@gmail.com](mailto:Luke.sandham@gmail.com)

#### Agricultural and Soils Impact Assessment and Brief Geotechnical Assessment

Contact person: Mr. Johan Lanz  
Postal Address: PO Box 6209, Uniedal, 7612, Stellenbosch  
Telephone: 021 866 1518 (w) 082 927 9018 (f)  
Email: [johann@johannlanz.co.za](mailto:johann@johannlanz.co.za)

#### Social Impact Assessment – Tony Barbour Environmental Consulting and Research

Contact person: Mr. Tony Barbour  
Postal Address: 4 Oakdale Road, Newlands, 7700  
Telephone: 021 683 7085 (w) 021 683 7085 (f) 082 600 8266 (Cell)  
Email: [tbarbour@telkomsa.net](mailto:tbarbour@telkomsa.net)

### **1.4 Status of the EIA process**

The EIA process is conducted strictly in accordance with the stipulations set out in Regulations 26 to 35 of R543. Table 1.1 provides a summary of the status of the EIA process and future steps to be taken. It can be confirmed that to date:

- A site visit was conducted on 19 March 2014 to discuss the proposed development and assess the site.
- A fully completed application form was submitted to the National Department of Environmental Affairs (DEA) on 26 March 2014 and the Department registered the application on the 9 April 2014.
- The public participation process was initiated on 19 March 2014 and all I&APs were requested to submit their comments by 19 May 2014.
- The Draft Scoping Report was submitted to the DEA on 22 May 2014.
- The Draft Scoping Report was made available to registered I&APs and relevant State Departments on 22 May 2014 and they were requested to provide their comments on the report within 40 days of the notification (1 July 2014).
- A public participation meeting was held on 10 June 2014, all I&APs were invited to attend.
- The Final Scoping Report (FSR) was submitted to the National DEA on 1 August 2014 and registered I&APs were notified of the availability of the report and requested to provide written comments on the FSR within 21 days of receiving the notification (28 July 2014).
- The Department of Environmental Affairs accepted the final scoping report in a letter dated 6 October 2014.
- The Draft EIR was submitted to the National DEA on 8 October 2014 and will be made available to registered I&APs and relevant State Departments on 8 October 2014. They will be requested to provide their comments on the report within 40 days of the notification (17 November 2014).

It is envisaged that the EIA process be completed within approximately eight months of submission of this report, i.e. by May 2014 – see Table 1.2.

**Table 1.2: Project schedule**

Activity	Prescribed timeframe	Timeframe
Submit application form	-	March 2014
Conduct initial public participation: 40 day commenting period	40 Days	March–May. 2014
Conduct specialist studies	-	May–Aug. 2014
Submit draft scoping report	-	May 2014
40 day commenting period on draft scoping report	40 Days	May-July. 2014
21 day commenting period on final scoping report	21 Days	July 2014
Submission of final scoping report	-	Aug. 2014
Submission of draft EIR & EMPr	-	Sept. 2014
Comment period on draft EIR & EMPr	40 Days	Sept.-Nov. 2014
Commenting period on final EIR & EMPr	21 Days	Nov. 2014
Submission of final EIR & EMPr	-	Dec. 2014
EIR & EMPr accepted	60 Days	March 2015
Decision	45 Days	April/May 2015
Registered I&APs notified of decision	12 Days	May 2015

### 1.5 Structure of the report

This report is structured in accordance with the prescribed contents stipulated in Regulation 31(2) of GNR545. It consists of eleven sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1.2.

**Table 1.2: Structure of the EIA report**

Requirements for the contents of a EIA report as specified in the Regulations		Section in report	Pages
31(2) An environmental impact assessment report must contain all the information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 36, and must include –			
(a)	details of -	1	1-7



	(i) the EAP who prepared the report; and		
	(ii) the expertise of the EAP to carry out an environmental impact assessment;		
(b)	a detailed description of the proposed activity;		
(c)	a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –	2	8-12
	(i) a linear activity, a description of the route of the activity; or		
	(ii) an ocean-based activity, the coordinates where the activity is to be undertaken;		
(d)	a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	3	13-18
(e)	details of the public participation process conducted in terms of sub regulation (1), including –	4	19-24
	(i) steps undertaken in accordance with the plan of study;		
	(ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;		
	(iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and		
	(iv) copies of any representations, objections and comments received from registered interested and affected parties;		
(f)	a description of the need and desirability of the proposed activity;		
(g)	A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;		
(h)	an indication of the methodology used in determining the significance of potential environmental impacts;		
(i)	a description and comparative assessment of all alternatives identified during the environmental impact assessment process;	5	25-82
(j)	a summary of the findings and recommendations of any specialist report or report on a specialised process;		
(k)	a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the		
(l)	an assessment of each identified potentially significant impact, including –		
	(i) cumulative impacts;		
	(ii) the nature of the impact;		

	(iii) the extent and duration of the impact;		
	(iv) the probability of the impact occurring;		
	(v) the degree to which the impact can be reversed;		
	(vi) the degree to which the impact may cause irreplaceable loss of resources; and		
	(vii) the degree to which the impact can be mitigated;		
(m)	a description of any assumptions, uncertainties and gaps in knowledge;		
(n)	A reasoned opinion as to whether the 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;		
(o)	an environmental impact statement which contains –	6	83-84
	(i) a summary of the key findings of the environmental impact assessment; and		
	(ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;		
(p)	a draft environmental management plan that complies with regulation 33;	Appendix F	
(q)	copies of any specialist reports and reports on specialised processes complying with regulation 32; and	Appendix D	
(r)	Any specific information that may be required by the competent authority; and	-	
(s)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.	-	
<b>(3) The EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub regulation 31(2)(g), exist.</b>		N/a	N/a

## 2. ACTIVITY DESCRIPTION AND ALTERNATIVES

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This section aims to address the following requirements of the regulations:

<p><b>31(2)</b> An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include –</p> <p>(b) a detailed description of the proposed activity;</p> <p>(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –</p> <p style="padding-left: 20px;">(i) a linear activity, a description of the route of the activity; or</p> <p style="padding-left: 20px;">(ii) an ocean-based activity, the coordinates where the activity is to be undertaken.</p>
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### 2.1 Project location and description

The activity entails the development of a photovoltaic solar facility and associated infrastructure on the Remaining Extent of the farm Honesty 43, Registration Division HN, North West situated within the Lekwa-Teemane Local Municipality area of jurisdiction. The proposed development is located in the North West Province, in the northern central interior of South Africa (refer to Figure 2 for the regional map). The town of Christiana is located approximately 24km north east of the proposed development (refer to Figure 1 for the locality map).

The project entails the generation of approximately 84MW electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 285 hectares (including supporting infrastructure on site) – refer to table 2.1 for general site information. The property on which the facility is to be constructed will be leased by Kappa Solar Power Plant (Pty) Ltd. from the property owner, which is Henning van Aswegen Familie Trust, for the life span of the project (minimum of 20 years).

**Table 2.1:** General site information

Description of affected farm portion	The Remaining Extent of the farm Honesty 43, Registration Division HN, North West
21 Digit Surveyor General codes	T0HN0000000004300000
Title Deed	T12163/2008
Photographs of the site	Refer to the Plates
Type of technology	Photovoltaic solar facility with crystalline silicon panels
Structure Height	Panels ~3.5m, buildings ~ 4m and power lines ~32m
Surface area to be covered	Approximately 285 hectares
Structure orientation	The panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.
Laydown area dimensions	Approximately 285 hectares
Generation capacity	84MW
Expected production	130 GWh per annum

## 2.2 Photovoltaic technology

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce 84MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV array which will comprise the PV facility. The PV panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.
- Wiring to Central Inverters - Sections of the PV array would be wired to central inverters sized from 500kW to 2MW. The inverter's role is to convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite substation will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid. Whilst Kappa Solar Power Plant has not yet received a cost estimate letter from Eskom, it is expected that generation from the facility will either tie in with the Honesty Traction 132kV Substation, which is located approximately 90m from the site or the Bloemheuwel-Ganspan. Although the generation capacity is 84MW the capacity at the point of connection with Eskom will be a maximum of 75MW.
- Supporting Infrastructure - A control facility with basic services such as water and electricity will be constructed on the site and will have an approximate footprint 400m<sup>2</sup> or less. Other supporting infrastructure includes voltage and current regulators and protection circuitry.
- Roads - Access to the site will be obtained from a local gravel road off the (N12) National Road. However an internal site road network to provide access to the solar field and associated infrastructure will be required. All site roads will require a width of approximately 4m.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.

## 2.3 Layout description

The layout plan will follow the limitations of the site and aspects such as environmentally sensitive areas, roads, fencing and servitudes will be considered. The total surface area proposed for layout options include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, transmission lines and perimeter fences). Due to the nature of the site being used for grazing (refer to the Plates), limited features of conservation significance exist apart from the pans located on or in close proximity to the site. The non-perennial pan located on the western portion of the site will not be included in the final layout plan. However the power line may be constructed within 500m of the non-perennial pan located east-southeast of the site in order to connect to the existing 132kV power line.

**Table 2.2:** General layout information

LAND USE	AREA (Square meters)
	Fixed/Tracker
Site	2 855 221
Laydown area	713.7
Substation	10 000
Inverter Station	19.19
Security building	400

## 2.4 Services provision

### 2.4.1 Water

Adequate provision of water will be a prerequisite for the development. Water for the proposed development will most likely be obtained from groundwater sources. A full assessment of the application for water use authorisation will only be undertaken in the event that the project proponent has been appointed as a preferred bidder by the Department of Energy.

The estimated maximum amount of water required during construction is 200m<sup>3</sup> per month during the 12 months of construction. The estimated maximum amount of water required during the facility's 20 years of production is 3 000m<sup>3</sup> per annum. The majority of this usage is for the cleaning of the solar panels. Since each panel requires approximately 2 liters of water for cleaning, the total amount of 350 000 panels will require 700 000 liters per wash. It is estimated that the panels may only need to be washed twice per annum, but provision is made for quaternary cleaning (March, May, July, and September). This totals approximately 2,800,000 liters per annum for washing, and allows 200,000 liters per annum (or 548 liter per day) for toilet use, drinking water, etc. This totals to approximately 3,000,000 liters of water required per annum.

Water saving devices and technologies such as the use of dual flush toilets and low-flow taps, the management of storm water, the capture and use of rainwater from gutters and roofs should be considered by the developer. Furthermore indigenous vegetation will be used during landscaping and the staff will be trained to implement good housekeeping techniques.

Portable chemical toilets will be utilized, that will be serviced privately or by the local municipality. Waste will be disposed at a licensed waste site (such as Hoopstad, Boshof, Vryburg, Wolmaranstad, Wesselsbron, Warrenton, Kimberley or Welkom). The construction and hazardous

waste will be removed to licensed landfill sites accepting such kinds of wastes. During the operational phase household waste will be removed to a licensed landfill site by a private contractor or by the local municipality. The relevant Local Municipality(s) was asked in a letter dated 30 June 2014 to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (20 years). Unfortunately no confirmation has yet been received.

#### **2.4.2 Storm water**

To avoid soil erosion, it is recommended that the clearing of vegetation be limited. It will also be good practice to design storm water canals into which the water from the panels can be channeled. These canals should reduce the speed of the water and allow the water to drain slowly onto the land. Storm water management and mitigation measures are included in the Environmental Management Programme (EMPr) – refer to Appendix F, section 2.5.4 amongst others.

#### **2.4.3 Sanitation and waste removal**

A closed septic (conservancy) tank will be installed on site to accommodate the sewerage from the office ablution facilities. The plant will not connect to the municipal sewage infrastructure but will make use of the local sewerage treatment plant.

The municipal landfill site will be used (either Hoopstad, Boshof, Vryburg, Wolmaranstad, Wesselsbron, Warrenton, Kimberley or Welkom) for the disposal of waste. Construction waste will most likely consist of concrete, scrap metal and general waste (cardboard packaging, wood, etc). The waste will be collected and stored in suitable receptacles where after it will be transported to the nearest licensed landfill. During the operational phase sources of general waste will be waste food, packaging, paper, etc. which will be stored on the site and removed on a weekly basis. The waste will be taken to a licenced landfill. If possible and feasible, all waste generated on site during the construction and operational phases must be separated into glass, plastic, paper, metal and wood to be recycled.

The relevant Local Municipality(s) was asked in a letter dated 30 June 2014 to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (20 years). Unfortunately no confirmation has yet been received.

#### **2.4.4 Electricity**

Electricity use will be limited, and will primarily be related to the lighting of the facility and domestic use. Design measures such as the use of energy saving light bulbs would be considered by the developer. During the day, electricity will be sources by the photovoltaic plant, and from the electricity connection at night.

### **2.5 Decommissioning of the facility**

The operating period will be 20 years from the commencement date. Thereafter two rights of renewal periods of 40 years and 20 years will be relevant. It is anticipated that new PV technologies and equipment will be implemented, within the scope of the Environmental Authorisation, when influencing the profitability of the solar facility.

A likely extension of the plant's lifetime would involve putting new, more efficient, solar panels on the existing structures. The specifications of these new panels will be the same as the current one, but for that the conversion efficiency of sunlight to energy will be greater (comparable to new computer chips, that the same, but faster and more efficient). If, for whatever reason the plant halts operations, the Environmental Authorisation and contract with the landowner will be respected during the decommissioning phase. The following clauses are an extract from the contract indicating the commitment to the rehabilitation of the area.

Lessee's obligation on termination:

Subject to any Environmental Approval being required and subject to any condition attaching to an existing Environmental Approval, if any, the Lessee shall upon the termination of this Agreement be entitled to remove any Project Equipment, which equipment shall at all times be regarded as movable, notwithstanding the manner and method by which it is affixed or shall otherwise have acceded to the Leased Premises. If the Lessee fails to remove any Project Equipment within a period of 6 (six) months of this Agreement terminating, the same shall become the property of the Lessor (as far as permitted in Law) and the Lessee shall not have any claim against the Lessor for compensation or otherwise in respect of any Project Equipment not removed. However, if the Lessee fails to remove any Project Equipment despite being requested to do so, in writing, the Lessor may remove the same and restore the Leased Premises at the expense of the Lessee.

Notwithstanding the provisions of the clause above and subject to compliance with Environmental Law, the Lessee shall take such measures to rehabilitate the Leased Premises as the Lessor directs, in writing, for the purpose of restoring the Leased Premises to the condition in which it was before the commencement of any Works, including amongst others, decommissioning the Energy Facility. The Lessee undertakes to complete any such rehabilitation or decommissioning within 6 (six) months after the Termination Date.

As security for the above and to the extent required by the Lessor, the Lessee shall furnish to, or in favour of, the Lessor, such security (and for such amount) as is acceptable to the Lessor. The Parties specifically agree that the amount of security required by the Lessor should at all times be reasonable and should under no circumstances whatsoever exceed an amount reasonably deemed acceptable and appropriate to cover the total cost of rehabilitation of the Leased Premises.

### 3. DESCRIPTION OF THE ENVIRONMENT

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This section aims to address the following requirements of the regulations:

- 31(2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include –
- (d) a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;

#### 3.1 Site description

The site description deals with land uses on site as well as land uses adjacent the development area (see Plates).

##### 3.1.1 Land uses on and adjacent the site

The site survey revealed that land uses on and in the immediate vicinity of the proposed development are essentially comprised of grazing (cattle) – refer to plates 1-14 for photographs of the development area. There is satellite imagery evidence of previous cultivation on part of the site, but there has been no cultivation on or surrounding the site within the last 10 years. Apart from stock watering points and fencing there is no agricultural infrastructure on the site.

#### 3.2 Description of the biophysical environment

The biophysical environment is described with specific reference to geology and soils, vegetation and landscape features, climate and the visual landscape. However, due to the fact that the area proposed for development exclusively consists of land used for grazing, nothing of note was identified from an ecological or conservation point of view apart from the wetlands and/or pans on or in close proximity to the site.

##### 3.2.1 Geotechnical conditions

According to Mucina and Rutherford (2006) the site is underlain by Andestic lavas of the Allanridge Formation and fine-grained sediments of the Karoo Supergroup. Deep (0.6 – 1.2m) sandy to loamy soils of the Hutton soil form (Ae and Ah land types) are present on slightly undulating sandy plains.

A brief preliminary geotechnical assessment was conducted in order to determine the area's suitability for the proposed development of a photovoltaic plant. The results of the assessment reveal that soil cover is continuous across the site and is likely to be 1.2 or more metres thick throughout. Vertic soils (swelling clays) of the Rensburg soil form occur at one place on the site. Perched surface water is likely to occur in the pan feature, after sufficient rain. According to the specialist the site should be regarded as suitable for the proposed development – refer to Appendix D5. It is however recommended that a detailed engineering geological investigation be conducted prior to construction and that site-specific precautionary measures be implemented.



### 3.2.2 Ecological habitat and landscape features

In terms of vegetation type the site falls within the Kimberley Thornveld vegetation type (Mucina and Rutherford, 2006). The Kimberley Thornveld vegetation type, is described by Mucina and Rutherford (2006) as 'least threatened'. Kimberley Thornveld vegetation covers areas of the North-West, Free State and Northern Cape Provinces. The region is characterised by plains often slightly irregular with well-developed tree layer with *Acacia erioloba*, *A. tortilis*, *A. karroo* and *Boscia albitrunca* and well-developed shrub layer with occasional dense stands of *Tarchonanthus camphoratus* and *A. mellifera*. The grass layer is open with much uncovered soil.

The Habitat Survey (refer to Appendix D3) confirmed that a very large part of the proposed footprint has very few trees and consists mainly of secondary or disturbed grass layer. Most conspicuous indigenous tree species include *Acacia tortilis* (Umbrella Thorn) and *Acacia hebeclada*. Much of the grass layer especially at areas that have hitherto been cultivated appears to have a high proportion of pioneer species such as *Aristida congesta*. *Eragrostis rigidior* (curly leaf) is also particularly common at the proposed footprint. Because of open areas and also sandy soil in certain areas trailing plant species such as *Senna italica* subsp. *arachoides* are also present. Hitherto cultivated fields with associated disturbance occur at the central and eastern parts of the site.

No wetlands are present at the site apart from a very small wetland area at the western extremes of the footprint proposed for the development. It should be noted that this wetland is poorly defined both in terms of hydrophytic vegetation and also in terms of soil indicators. This restricted wetland area is identified as a pre-caution. For perspective this small wetland area cannot be regarded as similar to unique salt pans in the larger area (region), of which the small wetland area is not nearly as significant or unique. There is little scope for corridors of particular conservation importance at the footprint though the wetland area could act as an important part of a stepping stone type conservation corridor.

It is unlikely that connectivity and important conservation corridors in the area would be significantly impacted. No loss of particularly sensitive habitat of particular conservation importance is anticipated if the site is developed. Loss of any plant or animal species of particular high conservation priority i.e. threatened or near threatened species, if the site is developed, is highly unlikely.

### 3.2.3 Soil, land capability and agricultural potential

Mr. Johan Lanz was appointed by Kappa Solar Power Plant (Pty) Ltd. to conduct a Agricultural and Soils Impact Assessment for the proposed development (refer to Appendix D5). The findings of the study are summarized below:

#### 3.2.3.1 Climate and water availability

The Lekwa-Teemane Local Municipality (LM) normally receives about 344mm of rain per year, with most rainfall occurring mainly during mid-summer. It receives the lowest rainfall (0mm) in June and the highest (70mm) in January. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Lekwa-Teemane LM range from 19°C in June to 32.9°C in January. The municipal area is the coldest during June when the temperature drops to 0°C on average at night. The municipal area is semi-arid, with occasional hail and frost. The area receives variable rain with scattered thunder storms and flooding. During hot summers there is high evaporation and elevated temperature (Lekwa-Teemane LM IDP, 2012/2017: 20).

One of the most important climate parameter for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into 6 categories across the country. The site falls into the 5th category, which is labelled as a severe limitation to agriculture.

There are wind pumps on the site, which are used for stock watering. The farm does not have access to water for irrigation.

### **3.2.3.2 Terrain, topography and drainage**

The proposed development is located on a terrain unit of level plains with some relief at an altitude of around 1,225 meters. Slope is less than 2% across the site. The geology is lava of the Ventersdorp Supergroup. There are no drainage courses on the site. In some areas perched surface water is likely to occur, after sufficient rain.

### **3.2.3.3 Soils**

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climate conditions into different land types. There is only one land type across the entire site and surrounds, namely Ae36. Soils of this land type are predominantly red Hutton soils but also include shallow soils on underlying hard pan carbonate and rock. These soils fall into the Oxidic and Calcic soil groups according to the classification of Fey (2010). The field investigation showed that soils on the site are almost entirely deep, red Hutton soils with some Clovelly soils, and vertic Rensburg soils in one pan area.

The soils are classified as having low susceptibility to erosion.

### **3.2.3.4 Agricultural capability**

Land capability is the combination of soil suitability and climate factors. The site and surrounds has a land capability classification, on the 8 category scale, of Class 5 – non-arable, moderate potential grazing land.

The limitations to agriculture are not soil related but only climate related. The moisture availability class 5 classification, with high variability of rainfall is a severe limitation to cultivation, which is not viable without irrigation. Suitability for maize is given on AGIS as marginal 10% (ISCW), and potential maize yield is given as 1.46 tons per hectare (Schulz). The grazing capacity varies from 11 to 20 hectares per large stock unit.

### **3.2.3.5 Land use and development on and surrounding the site**

The farm is located within a cattle farming agricultural region and used only for grazing. There is satellite imagery evidence of previous cultivation on part of the site, but there has been no cultivation on or surrounding the site within the last 10 years. Apart from stock watering points and fencing there is no agricultural infrastructure on the site.

### 3.2.4 Visual landscape

The visual impact of photovoltaic facility depends on the complex relationship between the visual environment (landscape), the development (object), and the observer/receptor (e.g. farmer). The establishment of a solar facility on the site is not expected to have a significant visual effect, given that the number of sensitive receptors is very low, electrical infrastructure are already located in close proximity to the site and the polycrystalline panels considered for this development are non-reflective. However due to the extent of the proposed development (285 hectares) the potential visual impact of the proposed PV plant was assessed using the following criteria which provide the means to measure the magnitude and determine the significance of the potential impact, namely: visibility, viewer sensitivity, visual exposure, visual intrusion, and the value of the visual resource (refer to Appendix D4 for the visual impact assessment). Each of these criteria is described in more detail below.

#### 3.2.4.1 Visibility

The viewshed covers a large area, which indicates a high visibility. Much or all of the PV plant will be visible from areas within and beyond the site, but due to the low population density of the area, there are very few visual receptors that may be significantly affected by the development.

The Visual Impact Assessment confirms that the site will be visible within most of the 1, 2 and 3 km zones, and beyond the 3 km zone the site is visible to a further area to the south east. Since this is sparsely populated agricultural land, there are very few visual receptors, apart from railway travellers, for whom the view is partial and transient, mitigated by a degree of screening by scattered trees and shrubs on the site. Moreover, the usage frequency of the railway for travellers is relatively low, hence the number of receptors is also relatively low. For motorists on the N12, the site is effectively invisible due to the 4 km distance from the site, and a degree of screening by scattered trees and shrubs on the site. In addition, since the N12 is located at the same or slightly lower height than the site, only the edge of the facility is likely to be visible.

#### 3.2.4.2 Sensitive Viewers and Viewpoints

The following sensitive viewers or viewpoints were identified:

- Railway travellers: The railway runs along the southern boundary of the site. Railway travellers are seen as low sensitivity visual receptors since they are transient and therefore likely to spend very little time studying the landscape, within which the site be only a partial view.
- Residents of surrounding areas and farmsteads: The development will potentially be visible from a small number of residents on neighbouring farms, whose viewpoints may be affected by the development. However, due to distance and the small numbers of such people, this area falls in the category of low viewer sensitivity.

The sensitivity of these groups can be rated as low.

### **3.2.4.3 Visual Exposure**

Railway travellers will experience low exposure to the project site, since only a short section of the railway line will be partially and transiently exposed to the PV plan where it passes along the southern boundary of the site. There are very few farmhouses surrounding the site so residents will have a potentially low exposure to the project.

### **3.2.4.4 Visual Intrusion**

Railway travellers will experience medium visual exposure and intrusion for a short section (approximately 1 km) as the railway approaches from the east and the west. Photovoltaic panels will be partially visible for a brief period.

Residents and workers on surrounding farmsteads currently have some elements common to developments in some of their views, including main roads (N12) and Eskom and railway power lines. They will experience low visual intrusion due mainly to distance from the site and also due to the topography which places the PV site at the same height or higher than the surrounding area and thereby presents only the edge of the site to view.

### **3.2.4.5 Visual resource value**

The site falls very clearly in the second lowest category i.e. it is improvable. It is therefore of low visual quality and hence of low value as a visual resource, to all of the potentially affected visual receptors i.e. the occupants of surrounding farms, and railway travellers.

## **3.3 Description of the socio-economic environment**

### **3.3.1 Socio-economic conditions**

According to the 2012/17 Lekwa-Teemane Local Municipality's IDP review the municipal area comprises a total area of 3 681, 25 km<sup>2</sup> and is located in the South-eastern part of the North-West Province. The municipal area covers the central part of the Southern District municipal area and neighbors the following municipalities: Maquassi Hills Local Municipality, Mamusa Local Municipality, Frances Baard District Municipality and Magareng Local Municipality.

Lekwa-Teemane's population is currently estimated at 49 765, this is 9.94% of the total population of Dr Ruth Segomotsi Mompati District Municipality. Water and sanitation backlog study (2007), depicts that Africans are in the majority and constitute 86.5% of the total population of Lekwa-Teemane LM. The Whites group is about 9% of the total population of Lekwa-Teemane LM, Coloured constitute 4.3% and the total percentage of Asians is 0.2%. The population growth is currently at 2.15% per annum and the unemployment rate is 30.5%.

The Lekwa-Teemane Local Municipality makes the following sectoral contribution within the Dr Ruth Segomotsi Mompati District Municipality: Agriculture and Hunting (12.6%), Transport (8%), Health and Social (5.8%), Education (5.7%) and food, beverages and tobacco (3%). This also suggests that these sectors are the largest employers in Lekwa-Teemane Local Municipality.

The Lekwa-Teemane Local Municipality's IDP (2012/17: 51) also reveals that a total of 1619 households (13%) use electricity for lighting. Estimated 8521 households (68.8%) use electricity for

lighting and other purposes. About 2228 households (18.0%) are not using electricity. A further 2228 households or (18.0%) have no electrical connections.

### 3.3.2 Cultural and heritage aspects

Special attention was given to the identification of possible cultural or heritage resources on site. The initial site investigation concluded that there are no obvious heritage resources located on the site earmarked for development. However a Heritage Impact Assessment has been conducted to ensure that there would be no impact on cultural or historical features as a result of the proposed development (refer to Appendix D3).

The town of Christiana was established in 1895 on the farm Zoutpansdrift. It is named after Christina, the daughter of M.W. Pretorius, the first president of the South African Republic (ZAR). The town achieved municipal status in 1904 (Raper 2004). The whole farm Honesty was originally granted to D R Janse van Vuuren on 16 October 1871. On 11 July 1895 it was transferred by Deed of Transfer 2328/1895 to J M Wessels.

An old farmstead consisting of a main house as well as some outbuildings (milk shed, store rooms, etc.) have been identified in the study area. A date of 1921 was added above the front door. From the variety of material used in constructing the different rooms - dressed stone, sundried brick and fired bricks - it is deduced that the main structure was built in different phases. The roof as well as all the fitting has been removed and only the walls remain. These are in a bad state of repair and most are in the process of collapsing.

The various outbuildings are totally in ruins and only vague outlines of the foundations remain. The garden consists of a number of large exotic trees (palms, Jacaranda, blue-gum, etc.). No graves were identified in the vicinity of the farmstead.

Within the context of farming activities in the larger region, this site is viewed to be one of a limited number that would have occurred in the region, i.e. usually only one farmstead would be located on a farm. Due to the limited number of such features in the larger landscape, it can therefore be seen to have a high significance on a regional level.

## 4. PUBLIC PARTICIPATION AND CONSULTATION

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This section aims to address the following requirements of the regulations:

- 31(2)** An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include –
- (e) details of the public participation process conducted in terms of sub regulation (1), including –
    - (i) steps undertaken in accordance with the plan of study;
    - (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;
    - (iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and
    - (iv) copies of any representations, objections and comments received from registered interested and affected parties.

### 4.1 Requirements for public participation included in the plan of study for EIA

Since no significant issues were raised by registered I&APs as part of the scoping process no additional participation measures were proposed to be included in the plan of study for EIA.

### 4.2 Public participation process

The public participation process was conducted strictly in accordance with Regulations 27 and 54 to 57. The following three categories of variables were taken into account when deciding the required level of public participation:

- The scale of anticipated impacts.
- The sensitivity of the affected environment and the degree of controversy of the project.
- The characteristics of the potentially affected parties.

Since the scale of anticipated impacts is low, the site already being degraded and the fact that no conflict were foreseen between potentially affected parties, no additional public participation mechanisms were considered at this stage of the process. The following actions have already been taken:

➤ Newspaper advertisement

Since the proposed development is unlikely to result in any impacts that extent beyond the municipal area where it is located, it was deemed sufficient to advertise in a local newspaper. An advertisement was placed in English in the local newspaper (Stellalander) on the 2 April 2014 (see Appendix G1) notifying the public of the EIA process and requesting Interested and Affected Parties (I&APs) to register with, and submit their

comments to Environamics Environmental Consultants. I&APs were given the opportunity to raise comments within 40 days of the advertisement.

➤ Site notices

Site notices were placed on site in English on the 19 March 2014 to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs were given the opportunity to raise comments by 19 May 2014. Photographic evidence of the site notices is included in Appendix G2.

➤ Direct notification of identified I&APs

Identified I&APs, including key stakeholders representing various sectors, were directly informed of the proposed development via registered post on 4 April 2014 and were requested to submit comments by 19 May 2014. For a complete list of stakeholder details see Appendix G3 and for proof of registered post see Appendix G4. The consultees included:

- North West Department of Economic Development, Environment, Conservation and Tourism (NWDEDECT)
- The Department of Energy
- The North West Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The North West Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), North West
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Dr. Ruth Segomotsi Mompati District Municipality
- The Municipal Manager at the Lekwa-Teemane Local Municipality
- The Local Councilor at the Lekwa-Teemane Local Municipality
- The Civil Aviation Authority (CAA)
- The North West Department of Public Works, Roads and Transport

It was expected from I&APs to provide their inputs and comments within 40 days after receipt of the notification. To date no comments have been received.

➤ Direct notification of surrounding land owners and occupiers

Written notices were also provided to all surrounding land owners and occupiers on 4 April 2014. The surrounding land owners were given the opportunity to raise comments within 40 days of the notification. To date only Mr. Uys of the farm Honesty provided comments (see Appendix E for written comments). For a list of surrounding land owners see Appendix G3.

➤ Circulation of Draft Scoping Report

The following registered I&APs and State Department were informed of the availability of the Draft Scoping Report:

- North West Department of Economic Development, Environment, Conservation and Tourism (NWDEDECT)
- The Department of Energy
- The North West Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The North West Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), North West
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Dr. Ruth Segomotsi Mompati District Municipality
- The Municipal Manager at the Lekwa-Teemane Local Municipality
- The Local Councilor at the Lekwa-Teemane Local Municipality
- The Civil Aviation Authority (CAA)
- The North West Department of Public Works, Roads and Transport

It was expected from I&APs to provide their inputs and comments within 40 days after receipt of the notification or copy of the Draft report. To date only Eskom and PRASA provided comments (see Appendix E for written comments).

➤ Public participation meeting

All I&AP's were invited to attend the public meeting held at De Akker Dorpshuis in Christiania on 10 June 2014 at 17:00. The public meeting was an opportunity to share information regarding the proposed development and provide I&AP's an opportunity to raise any issues and provide comments. An advertisement was placed in English in the local newspaper (Stellalander) on 4 June 2014 to notify the public of the public meeting. The following key stakeholders were also directly informed of the public meeting via email on 30 May 2014:

- The North West Department of Agriculture, Conservation, Environment and Rural Development (NWDEDECT)
- The Department of Water Affairs
- The National Department of Agriculture
- The Department of Energy
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), North West
- ESKOM
- The Dr. Ruth Segomotsi Mompati District Municipality
- Lekwa-Teemane Local Municipality
- Department of Mineral Resources (DMR)
- Department of Transport (DoT)
- Department of Communications (DoC)
- SENTECH
- Transnet
- Passenger Rail Agency of South Africa (PRASA)



- The South African National Roads Agency Ltd. (SANRAL)
- The North West Department of Public Works, Roads and Transport
- Mr. Uys of the farm Honesty

No one attended the meeting. Refer to Appendix G for the PowerPoint presentation.

➤ Circulation of Final Scoping Report

The following registered I&APs and State Department were either informed of the availability of the Final Scoping Report or provided with a copy of the report (refer to Appendix G4):

- The North West Department of Agriculture, Conservation, Environment and Rural Development (NWDEDECT)
- The Department of Water Affairs
- The National Department of Agriculture
- The Department of Energy
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), North West
- ESKOM
- The Dr. Ruth Segomotsi Mompati District Municipality
- Lekwa-Teemane Local Municipality
- Department of Mineral Resources (DMR)
- Department of Transport (DoT)
- Department of Communications (DoC)
- SENTECH
- Transnet
- Passenger Rail Agency of South Africa (PRASA)
- The South African National Roads Agency Ltd. (SANRAL)
- The North West Department of Public Works, Roads and Transport
- Mr. Uys of the farm Honesty

It was expected from I&APs to provide their inputs and comments within 21 days after receipt of the report. No additional comments have been received (see Appendix E for written comments).

### 4.3 Consultation process

Regulation 54 requires that the municipality, relevant ward councilor and any organ of state having jurisdiction in respect of any aspect of the activity should be given written notice of the activity. A complete list of all the consultees who received written notices as well as proof of registered post is attached as Appendices G3 and G4.

### 4.4 Registered I&APs

I&APs include all stakeholders who deem themselves affected by the proposed activity. According to Regulation 56(1) "A registered interested and affected party is entitled to comment, in writing, on all written submissions, including Final reports made to the competent authority". This report is the Draft Environmental Impact Report (EIR) to be submitted to the department of Environmental

Affairs. The following registered I&APs and State Departments will be provided with a copy of the Draft EIR:

- The North West Department of Agriculture, Conservation, Environment and Rural Development (NWDEDECT)
- The Department of Water Affairs
- The National Department of Agriculture
- The Department of Energy
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), North West
- ESKOM
- The Dr. Ruth Segomotsi Mompati District Municipality
- Lekwa-Teemane Local Municipality
- Department of Mineral Resources (DMR)
- Department of Transport (DoT)
- Department of Communications (DoC)
- SENTECH
- Transnet
- Passenger Rail Agency of South Africa (PRASA)
- The South African National Roads Agency Ltd. (SANRAL)
- The North West Department of Public Works, Roads and Transport
- Mr. Uys of the farm Honesty

The key stakeholders will be requested to provide their inputs and comments within 40 days after receipt of the draft EIR.

#### 4.5 Issues raised by IAPs and consultation bodies

Table 4.1 summarizes the comments received from consultation bodies. The full wording and original correspondence is included in Appendix E.

**Table 4.1:** Issues raised by key consultation bodies

Organisation	Person	Written comment (see Appendix E)
I&AP	Mr. C.S. Uys of the farm Honesty	Mr. Uys noted in a letter dated 29 April 2014 that he supports the proposed project and would like to register the member of Uys Gesins Trust as an I&AP. He requested to be formally informed of the date, time and venue of any public meetings. He also requested to know who the developers are and how the locality of the proposed project was selected. He would also like to know who will be responsible for maintaining the access road off the N12, how it will be maintained and how veldt fires will be prevented since the road runs through his property. He would also like to know if temporary housing courtiers will be provided during the construction phase of the project. He confirmed that he is an adjacent land owner and that the substation is located on his property. He expressed his

		<p>interest in leasing or selling a portion of his property to the developers.</p> <p>Mr. C.S. ("Josef") Uys formally requested for postponing the delivery of written comments on the EIA Reports till not later than 31 July 2014. The request is imposed by circumstances beyond Mr. Uys' control resulting from both being occasionally hospitalized (following a motor accident) and awaiting crucial information that is pending from a third party / institution pertaining this matter and the relevance of comments.</p>
Eskom	<p>John Geeringh (Pr Sci Nat) Senior Consultant Environmental Management Eskom GC: Land Development</p>	<p>Mr. Geeringh stated in an email dated 26 May 2014 that the draft scoping reports sent to Ronald Marais does not contain a locality map, which makes it difficult to comment in terms of connection options, impacts on Eskom infrastructure, etc. The email provided two documents outlining Eskom requirements for works at or near Eskom infrastructure.</p>
PRASA	<p>Ms. Johanna Lata Regional Planner Southern Gauteng</p>	<p>Ms. Lata stated in a letter dated 28 May 2014 that PRASA has no objections to the approval of the proposed development.</p>

## 5. ENVIRONMENTAL IMPACT ASSESSMENT

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This section aims to address the following requirements of the regulations:

- 31(2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include –
- f) a description of the need and desirability of the proposed activity;
  - g) a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;
  - h) an indication of the methodology used in determining the significance of potential environmental impacts;
  - i) a description and comparative assessment of all alternatives identified during the environmental impact assessment process;
  - j) a summary of the findings and recommendations of any specialist report or report on a specialised process;
  - k) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
  - l) an assessment of each identified potentially significant impact, including –
    - (i) cumulative impacts;
    - (ii) the nature of the impact;
    - (iii) the extent and duration of the impact;
    - (iv) the probability of the impact occurring;
    - (v) the degree to which the impact can be reversed;
    - (vi) the degree to which the impact may cause irreplaceable loss of resources; and
    - (vii) the degree to which the impact can be mitigated;
  - m) a description of any assumptions, uncertainties and gaps in knowledge;

### 5.1 The need for the proposed development

The proposed activity is a direct result of the growing demand for electricity and the need for renewable energy in South Africa. According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental responsible development, the impacts of climate change and the need for sustainable development.

The primary rationale for the proposed solar PV facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by the DoE (Integrated Resource Plan 2010-2030). In terms of the Integrated Resource Plan (IRP), approximately 8.4GW of the renewable energy mix is planned to be the new installed capacity generated from solar PV technologies over the next thirty years.

The establishment of the solar PV facility will significantly contribute to achieving this objective and will also address some of the social and economic challenges identified by the Lekwa-Teemane Local Municipality's Integrated Development Plan (IDP, 2012/17).

## 5.2 The desirability of the proposed development

The facility's contribution towards sustainable development and the associated benefits to society in general is discussed below:

- Lesser dependence on fossil fuel generated power - The deployment of the facility will have a positive macro-economic impact by reducing South Africa's dependence on fossil fuel generated power and assisting the country in meeting its growing electricity demand.
- Increased surety of supply - By diversifying the sources of power in the country, the surety of supply will increase. The power demands of South Africa are ever increasing and by adding solar power this demand can be met, even exceeded without increasing pollution in relation to the use of fossil fuels. The project has the potential of "securing" economic activity by assisting in removing supply constraints if Eskom generation activities result in a supply shortfall. When supply is constrained it represents a limitation to economic growth. When a supply reserve is available, it represents an opportunity for economic growth.
- Local economic growth - The proposed project will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the North West Province. The project will likely encounter widespread support from government, civil society and businesses, all of whom see potential opportunities for revenues, employment and business opportunities locally. The development of the photovoltaic solar facility will in turn lead to growth in tax revenues for local municipalities and sales of carbon credits, resulting in increased foreign direct investment.
- Lower costs of alternative energy - An increase in the number of solar facilities commissioned will eventually reduce the cost of the power generated through solar facilities. This will contribute to the country's objective of utilising more renewable energy and less fossil fuel based power sources. It will assist in achieving the goal to generate 10 000 GWh of electricity from renewable energy by 2015 and the reduction of South Africa's GHG emissions by approximately 34% below the current emissions baseline by 2020.
- Reduction in greenhouse gas emissions - The additional power supplied through solar energy will reduce the reliance on the combustion of fossil fuels to produce power. The South African electricity grid is predominantly coal-fired and therefore GHG emissions intensive (coal accounts for more than 92% of the fuel used in South Africa's electricity generation). The reduction of GHG emissions as a result of the project implementation will be achieved due to reduction of CO<sub>2</sub> emissions from combustion of fossil fuel at the existing grid-connected power plants and plants which would likely be built in the absence of the project activity.

- CDM Project - A solar energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of renewable technologies).
- Climate change mitigation - On a global scale, the project makes a contribution to greenhouse gas emission reduction and therefore contributes toward climate change mitigation.
- Reduced environmental impacts - The reduction in electricity consumed from the grid will not only result in a reduction in greenhouse gas emissions, but also the prevention of negative impacts associated with coal mining. For example, coal power requires high volumes of water, in areas of South Africa where water supply is already over-stretched and water availability is highly variable. Photovoltaic solar energy technology also does not produce the sulphur emissions, ash or coal mining concerns associated with conventional coal fired electricity generation technologies resulting in a relatively low level of environmental impacts. It is a clean technology which contributes toward a better quality environment for employees and nearby communities.
- Social benefits - The project activity is likely to have significant long-term, indirect positive social impacts that may extend to a regional and even national scale. The larger scale impacts are to be derived in the utilization of solar power and the experience gained through the construction and operation of the power plant. In future, this experience can be employed at other similar solar installations in South Africa.
- Provision of job opportunities - The main benefit of the proposed development operating in the area is that local companies or contractors will be hired for the duration of the construction period. The operational phase will provide permanent job opportunities to the local communities from the surrounding area since security guards and general labourers will be required on a full time basis. Approximately 510 employment opportunities will be created during the construction and operational phases.
- Indirect socio-economic benefits - The increase in the demand for services such as accommodation, transportation, security, general maintenance and catering will generate additional indirect socio-economic benefits for the local community members.

### 5.3 Consideration of alternatives

The DEAT 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal. The following sections explore each type of alternative in relation to the proposed activity.

### 5.3.1 No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. The description provided in section 3 of this report could be considered the baseline conditions (status quo) to persist should the no-go alternative be preferred. The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for low density cattle grazing (refer to plates for photographs of the site).

*According to the Social Impact Assessment (2014) the no-go alternative "would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. The no-go alternative also represents a lost opportunity in terms of the employment and business opportunities associated with the proposed development, and the benefits associated with the establishment of a Community Trust. This also represents a negative social cost".*

*The Social Impact Assessment (2014) further states that "at a provincial and national level, it should be noted that the proposed development is not unique. In that regard, a significant number of renewable energy developments, are currently proposed in the North West Province and South Africa. Foregoing the proposed development would therefore not necessarily compromise the development of renewable energy facilities in the North West Province or South Africa. However, the socio-economic benefits the local communities in the Lekwa-Teemane Local Municipality would be foregone. Given the high unemployment levels and limited job opportunities this would represent a significant lost opportunity".*

### 5.3.2 Location alternatives

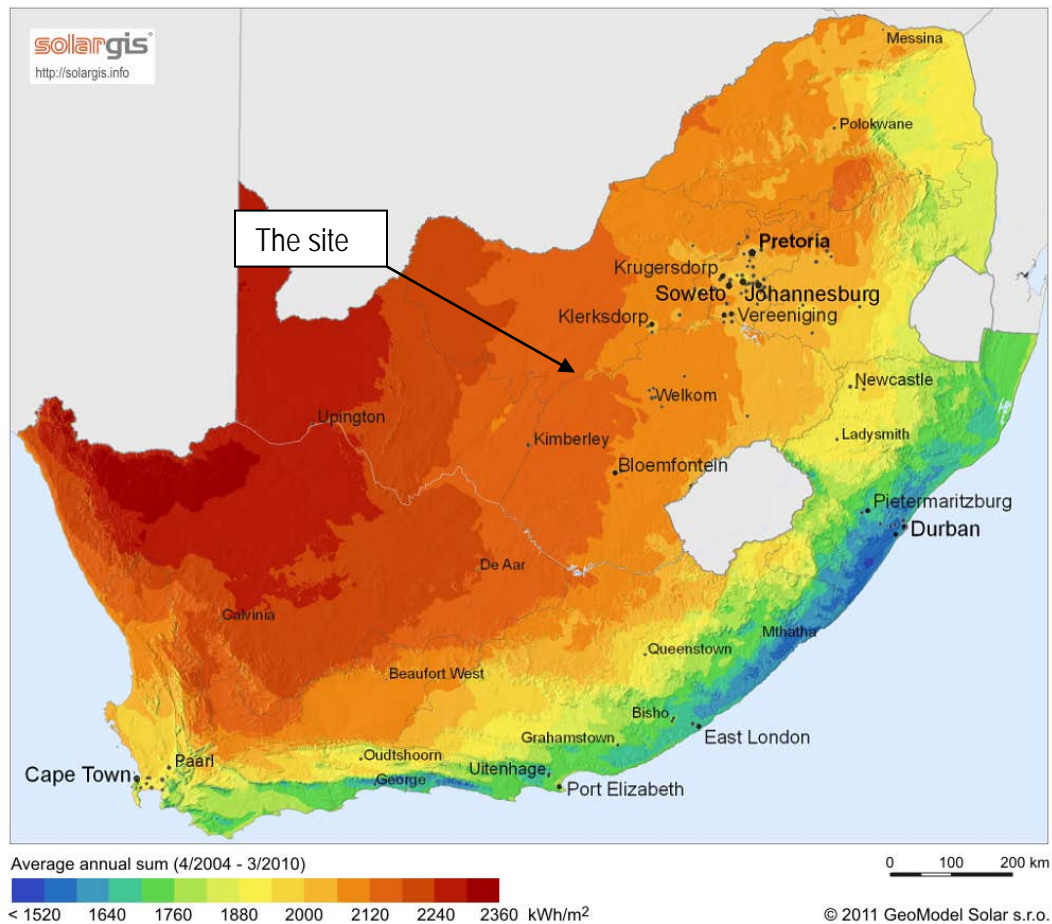
This alternative asks the question, if there is not, from an environmental perspective, a more suitable location for the proposed activity. No other properties have at this stage been secured by Kappa Solar Power Plant in the Christiana area to potentially establish solar facilities. From a local perspective, the Remaining Extent of the farm Honesty 43 is preferred due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. agricultural potential, geology and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation), as well as site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase).

The proposed development falls within an area used for grazing and the site is therefore considered to have limited environmental sensitivity as a result. The National Department of Agriculture (2006) classified land capability into two broad categories, namely land suited to cultivation (Classes I – IV) and land with limited use, generally not suited to cultivation (Classes V – VIII). The site falls within Class V and therefore the agricultural potential of the site is limited and it is unlikely that the change in land use will impact significantly on agricultural production (refer to figure 3 for an illustration of the land capability classification).

### 5.3.3 Activity alternatives

The EIA process also needs to consider if the development of a photovoltaic solar facility would be the most appropriate land use for the particular site.

Photovoltaic (PV) solar facility – Kappa Solar Power Plant is establishing a portfolio of solar PV projects throughout South Africa. Kappa Solar Power Plant is of the opinion that solar PV technology is perfectly suited to the site, given the high irradiation values for the Christiana area – refer to figure 6.



**Figure 6:** Horizontal irradiation for South Africa (SolarGIS, 2011)

The technology furthermore entails low visual impacts, have relatively low water requirements, is a simple and reliable type of technology and all of the components can be recycled.

Wind energy facility - Due to the local climatic conditions a wind energy facility is not considered suitable as the area does not have the required wind resource. Furthermore the applicant has opted for the generation of electricity via solar power rather than the use of wind turbines. This alternative is therefore regarded as not feasible and will not be evaluated further in this report.

Concentrated solar power (CSP) technology - CSP technology requires large volumes of water and this is a major constraint for this type of technology in the proposed project area. While the irradiation values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible. Therefore, this alternative will not be considered further in this report.



### 5.3.4 Technical alternatives

It is expected that generation from the facility will either tie in with the Honesty Traction 132kV Substation, which is located approximately 90m from the site or the Bloemheuwel-Ganspan – refer to Figure 3 for the development footprint map. The transmission line will be constructed within 36m wide servitude and will traverse the Remaining Extent of the farm Honesty 43. The 132kV overhead transmission line is the only preferred alternative for the applicant due to the following reasons:

Overhead Transmission Lines - Overhead lines are less costly to construct than underground lines. Therefore, the preference with overhead lines is mainly on the grounds of cost. Overhead lines allow high voltage operations and the surrounding air provides the necessary electrical insulation to earth. Further, the surrounding air cools the conductors that produce heat due to lost energy (Swingler et al, 2006).

The overall weather conditions in the North West Province are less likely to cause damage and faults on the proposed overhead transmission power line. Nonetheless, if a fault occurs, it can be found quickly by visual means using a manual line patrol. Repair to overhead lines is relatively simple in most cases and the line can usually be put back into service within a few days. In terms of potential impacts caused by overhead transmission lines include visual intrusion and threats to sensitive habitat (where applicable).

Underground Transmission Lines - Underground cables have generally been used where it is impossible to use overhead lines for example because of space constraints. Underground cables are oil cooled and are also at risk of groundwater contamination. Maintenance is also very difficult on underground lines compared to overhead lines. When a fault occurs in an underground cable circuit, it is almost exclusively a permanent fault due to poor visibility. Underground lines are also more expensive to construct than overhead lines

### 5.3.5 Design and layout alternatives

Design alternatives were considered throughout the planning and design phase (i.e. what would be the best design option for the development?). In this regard discussions on the design were held between the EAP and the developer. The layout follows the limitations of the site and aspects such as environmental sensitive areas, roads, fencing and servitudes are considered – refer to figure 7. The total surface area proposed for layout options include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, transmission lines and perimeter fences).

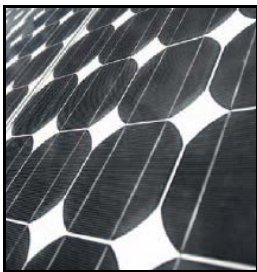
With regards to the structure orientation, the panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun. The Draft layout plans illustrate the layout of the infrastructure for both options.

### 5.3.6 Technology alternatives

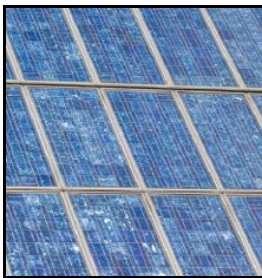
There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon and thin film. These technologies are discussed in more detail below:

#### Crystalline (high efficiency technology at higher cost):

Crystalline silicon panels are constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are then assembled together in multiples to make a solar panel. Crystalline silicon, also called wafer silicon, is the oldest and the most widely used material in commercial solar panels. Crystalline silicon modules represent 85-90% of the global annual market today. There are two main types of crystalline silicon panels that can be considered for the solar facility:



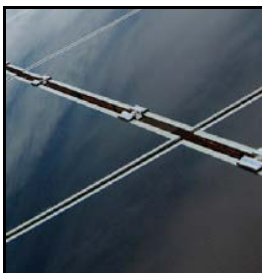
- Mono-crystalline Silicon – mono-crystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Mono-crystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and have the most involved manufacturing process.



- Multicrystalline Silicon - Multicrystalline (also called polycrystalline) panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than monocrystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than mono-crystalline silicon. They are also less efficient, though the performance gap has begun to close in recent years (First Solar, 2011).

#### Thin film (low-cost technology with lower efficiency):

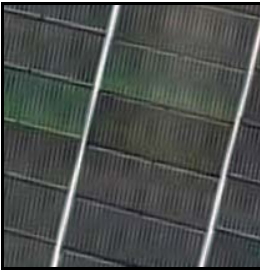
Thin film solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. The term *thin film* refers to the amount of semiconductor material used. It is applied in a thin film to a surface structure, such as a sheet of glass. Contrary to popular belief, most thin film panels are not flexible. Overall, thin film solar panels offer the lowest manufacturing costs, and are becoming more prevalent in the industry. Thin films currently account for 10-15% of global PV module sales. There are three main types of thin film used:



- Cadmium Telluride (CdTe) - CdTe is a semiconductor compound formed from cadmium and tellurium. CdTe solar panels are manufactured on glass. They are the most common type of thin film solar panel on the market and the most cost-effective to manufacture. CdTe panels perform significantly better in high temperatures and in low-light conditions.



- Amorphous Silicon - Amorphous silicon is the non-crystalline form of silicon and was the first thin film material to yield a commercial product, first used in consumer items such as calculators. It can be deposited in thin layers onto a variety of surfaces and offers lower costs than traditional crystalline silicon, though it is less efficient at converting sunlight into electricity.



- Copper, Indium, Gallium, Selenide (CIGS) - CIGS is a compound semiconductor that can be deposited onto many different materials. CIGS has only recently become available for small commercial applications, and is considered a developing PV technology (First Solar, 2011).

The technology that proved most feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels. Although it is more expensive than thin films it is approximately 10 times more efficient, is non-reflective and has a higher durability than thin-film systems. The active material in thin films tends to be less stable than crystalline causing degradation over time and the lower cost to manufacture some of the module technologies is partially offset by the higher area-related system costs (costs for mounting and the land required) due to their lower conversion efficiency. Furthermore thin film modules have higher visibility and reflections.

#### 5.4 Methodology for the identification of key issues

The methodology for the identification of key issues aims, as far as possible, to provide a user-friendly analysis of information to allow for easy interpretation.

- Checklist (see section 5.2): The checklist consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts.
- Matrix (see section 5.3): The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity. The matrix is designed to indicate the relationship between the different stressors and receptors which leads to specific impacts. The matrix also indicates the specialist studies, which will be submitted as part of the Environmental Impact Report in order to address the potentially most significant impacts. The matrix also indicates the specialist studies, which are submitted as part of the EIR in order to address the potentially most significant impacts.

#### 5.5 Checklist analysis

The independent consultant conducted a site visit on 19 March 2014. The site visit was conducted to ensure a proper analysis of the site specific characteristics of the study area. Table 5.1 provides a checklist, which is designed to stimulate thought regarding possible consequences of specific actions and so assist scoping of key issues. It consists of a list of structured questions related to

the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts. The table highlights certain issues, which are further analysed in matrix format in section 5.3.

**Table 5.1: Environmental checklist**

QUESTION	YES	NO	Un-sure	Description
<b>1. Are any of the following located on the site earmarked for the development?</b>				
I. A river, stream, dam or wetland	✗			The Ecological Habitat Survey (refer to Appendix D3) confirmed that no wetlands are present at the site, apart from one small poorly defined wetland flat at the western part of the site.
II. A conservation or open space area		✗		None.
III. An area that is of cultural importance	✗			The Heritage Impact Assessment (refer to Appendix D2) concluded that there is an old farmstead consisting of a main house as well as some outbuildings (milk shed, store rooms, etc.) in the study area. A date of 1921 was added above the front door.
IV. Site of geological significance		✗		The geotechnical study (refer to Appendix D5) confirmed that the study area is deemed suitable for the proposed development.
V. Areas of outstanding natural beauty		✗		None.
VI. Highly productive agricultural land		✗		The Agricultural and Soils Impact Assessment (refer to Appendix D5) confirmed that the proposed development will have a low negative impact on agricultural potential in terms of cattle production in the area, and no negative impact on crop production.
VII. Floodplain		✗		None.
VIII. Indigenous forest		✗		None.
IX. Grass land		✗		None.
X. Bird nesting sites		✗		None.
XI. Red data species		✗		None.
XII. Tourist resort		✗		None.
<b>2. Will the project potentially result in potential?</b>				
I. Removal of people		✗		None.

II. Visual Impacts	×			The Visual Impact Assessment (Refer to Appendix D4) concluded that the proposed development will have a limited visual impact on the visual environment within 2 km of the proposed facility.
III. Noise pollution		×		Construction activities will result in the generation of noise over a period of months. The noise impact is unlikely to be significant.
IV. Construction of an access road		×		A new access point/road will be required at the southern point of the development. An internal site road network will also be required to provide access to the solar field and associated infrastructure. All site roads will require a width of approximately 4m.
V. Risk to human or valuable ecosystems due to explosion/fire/ discharge of waste into water or air.		×		None.
VI. Accumulation of large workforce (>50 manual workers) into the site.	×			Approximately 450 employment opportunities will be created during the construction phase of the project.
VII. Utilisation of significant volumes of local raw materials such as water, wood etc.	×			The estimated maximum amount of water required during the facility's 20 years of production is approximately 3 000m <sup>3</sup> per annum.
VIII. Job creation	×			Approximately 510 employment opportunities will be created during the construction and operational phases.
IX. Traffic generation		×		None.
X. Soil erosion		×		The site will need to be cleared or graded to a limited extent, which may potentially result in a degree of dust being created, increased runoff and potentially soil erosion. The time that these areas are left bare will be limited to the construction phase, since vegetation will be allowed to grow back after construction. The Agricultural and Soils Impact Assessment (refer to Appendix D5) confirmed that the soils are classified as having low susceptibility to erosion
XI. Installation of additional bulk telecommunication transmission lines or facilities		×		None.

3. Is the proposed project located near the following?				
I. A river, stream, dam or wetland	X			The site is located in an area characterised by non-perennial pans. However, due to the size of the site (285 hectares) sensitive areas surrounding the pans will be excluded from the final layout plan wherever possible..
II. A conservation or open space area		X		None.
III. An area that is of cultural importance		X		None.
IV. A site of geological significance		X		None.
V. An area of outstanding natural beauty		X		None.
VI. Highly productive agricultural land		X		None.
VII. A tourist resort		X		None.
VIII. A formal or informal settlement		X		None.

## 5.6 Matrix analysis

The matrix describes the relevant listed activities, the aspects of the development that will apply to the specific listed activity, a description of the environmental issues and potential impacts, the significance and magnitude of the potential impacts, and the mitigation of the potential impacts. The matrix also highlights areas of particular concern (see Table 5.2), which requires more in depth assessment (refer to section 5.10). An indication is also provided of the specialist studies which were conducted. Each cell is evaluated individually in terms of the nature of the impact, duration and its significance – should no mitigation measures be applied. This is important since many impacts would not be considered insignificant if proper mitigation measures were implemented. The matrix also provides an indication if mitigation measures are available.

In order to conceptualise the different impacts the matrix specify the following:

- **Stressor:** Indicates the aspect of the proposed activity, which initiates and cause impacts on elements of the environment.
- **Receptor:** Highlights the recipient and most important components of the environment affected by the stressor.
- **Impacts:** Indicates the net result of the cause-effect between the stressor and receptor.
- **Mitigation:** Impacts need to be mitigated to minimise the effect on the environment.

Table 5.2: Matrix Analysis

LISTED ACTIVITY (The Stressor)	ASPECTS OF THE DEVELOPMENT /ACTIVITY	POTENTIAL IMPACTS		SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS			MITIGATION OF POTENTIAL IMPACTS		SPECIALIST STUDIES / INFORMATION		
		Receptors	Impact description	Minor	Major	Duration	Possible Mitigation	Mitigation measures provided in EMPr			
<b>CONSTRUCTION PHASE</b>											
<p><b>Activity 10(i) (Regulation 544):</b> "The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts".</p> <p><b>Activity 1 (Regulation 545):</b> "The construction of facilities or infrastructure where the electricity output is 20 megawatts or more."</p>	<p><u>Site clearing and preparation</u> Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled.</p> <p><u>Civil works</u> The main civil works are:</p> <ul style="list-style-type: none"> <li>• Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat.</li> <li>• Laying foundation- The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will depend on the detailed geotechnical analysis.</li> <li>• Construction of access and inside roads/paths – existing paths will be used where reasonably possible. Additionally, the turning circle for trucks will also be taken into consideration.</li> <li>• Trenching – all Direct Current (DC) and Alternating Current (AC) wiring within the PV plant will be buried underground. Trenches will have a river sand base, space for pipes, backfill of sifted soil and soft sand and concrete layer where vehicles will pass.</li> </ul> <p><u>Transportation and installation of PV panels into an Array</u> The panels are assembled at the supplier's premises and will be transported from the factory to the site on trucks. The panels will be mounted on metal structures which are fixed into the ground either through a concrete foundation or a deep seated screw.</p> <p><u>Wiring to the Central Inverters</u> Sections of the PV array would be wired to central inverters which have a maximum rated power of 2000kW each. The inverter is a pulse width mode inverter that converts DC electricity to alternating</p>	<b>BIOPHYSICAL ENVIRONMENT</b>	Fauna & Flora	<ul style="list-style-type: none"> <li>• Loss or fragmentation of indigenous natural vegetation.</li> <li>• Loss of sensitive species.</li> <li>• Loss or fragmentation of habitats.</li> </ul>		-	S	Yes	Table 17 & 18	Ecological Fauna and Flora Habitat Survey	
			Air	<ul style="list-style-type: none"> <li>• Air pollution due to the increase of traffic of construction vehicles.</li> </ul>	-		S	Yes	Table 19	-	
			Soil	<ul style="list-style-type: none"> <li>• Soil degradation, including erosion.</li> <li>• Disturbance of soils and existing land use (soil compaction).</li> </ul>		-	S	Yes	Table 9, 12 & 13	Agricultural and Soils Impact Assessment	
			Geology	<ul style="list-style-type: none"> <li>• Collapsible soil.</li> <li>• Seepage (shallow water table).</li> <li>• Active soil (high soil heave).</li> <li>• Erodible soil.</li> <li>• Hard/compact geology. If the bedrock occurs close to surface it may present problems when driving solar panel columns.</li> <li>• The presence of undermined ground.</li> <li>• Instability due to soluble rock.</li> <li>• Steep slopes or areas of unstable natural slopes.</li> <li>• Areas subject to seismic activity.</li> <li>• Areas subject to flooding.</li> </ul>		-	S	Yes	Table 12	Brief Geotechnical Assessment as part of the Agricultural and Soils Impact Assessment	
			Existing services infrastructure	<ul style="list-style-type: none"> <li>• Generation of waste that need to be accommodated at a licensed landfill site.</li> <li>• Generation of sewage that need to be accommodated by the local sewage plant.</li> </ul>		-	S	Yes	Table 16	Confirmation from the Local Municipality	
			Ground water	<ul style="list-style-type: none"> <li>• Pollution due to construction vehicles.</li> </ul>	-		S	Yes	Table 14 & 15	-	
			Surface water	<ul style="list-style-type: none"> <li>• Increase in storm water run-off.</li> <li>• Pollution of water sources due to soil erosion.</li> <li>• Destruction of watercourses (wetlands/pans).</li> </ul>		-	S	Yes	Table 9, 14 & 15	Wetland assessment as part of the ecological fauna and flora habitat survey	
			<b>SOCIAL/ECONOMIC ENVIRONMENT</b>	Local unemployment rate	<ul style="list-style-type: none"> <li>• Job creation.</li> <li>• Business opportunities.</li> <li>• Skills development.</li> </ul>		+	S	Yes	Table 22	Social Impact Assessment
				Visual landscape	<ul style="list-style-type: none"> <li>• Potential visual impact on residents of farmsteads and motorists in close proximity to proposed facility.</li> </ul>	-		S	Yes	Table 28	-
				Traffic volumes	<ul style="list-style-type: none"> <li>• Increase in construction vehicles.</li> </ul>	-		S	Yes	Table 10	-
				Health & Safety	<ul style="list-style-type: none"> <li>• Air/dust pollution.</li> <li>• Road safety.</li> <li>• Impacts associated with the presence of construction workers on site and in the area.</li> <li>• Influx of job seekers to the area.</li> </ul>		-	S	Yes	Table 10 & 23	Social Impact Assessment

	electricity (AC) at grid frequency.			<ul style="list-style-type: none"> <li>Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site.</li> <li>Increased risk of veld fires.</li> </ul>							
			Noise levels	<ul style="list-style-type: none"> <li>The generation of noise as a result of construction vehicles, the use of machinery such as drills and people working on the site.</li> </ul>	-		S	Yes	Table 10 & 19	-	
			Tourism industry	<ul style="list-style-type: none"> <li>Since there are no tourism facilities in close proximity to the site, the proposed activities will not have an impact on tourism in the area.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-	
			Heritage resources	<ul style="list-style-type: none"> <li>Removal or destruction of archaeological sites.</li> <li>Removal or destruction of buildings, structures, places and equipment of cultural significance.</li> <li>Removal or destruction of graves, cemeteries and burial grounds.</li> </ul>			S	Yes	Table 26	Heritage Impact Assessment	
<p>Activity 14(a)(i) (Regulation 546):  <i>"The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation- (a) North West Province (i) All areas outside urban areas."</i></p>	<p>Site clearing and preparation  Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled. This will inevitably result in the removal of indigenous vegetation located on the site.</p>	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> <li>Loss or fragmentation of indigenous natural vegetation.</li> <li>Loss of sensitive species.</li> <li>Loss or fragmentation of habitats.</li> </ul>			S	Yes	Table 17 & 18	Ecological Fauna and Flora Habitat Survey	
			Air quality	<ul style="list-style-type: none"> <li>Air pollution due to the increase of traffic.</li> </ul>	-		S	Yes	Table 19	-	
			Soil	<ul style="list-style-type: none"> <li>Soil degradation, including erosion.</li> <li>Disturbance of soils and existing land use (soil compaction).</li> <li>Loss of agricultural potential (low significance relative to agricultural potential of the site).</li> </ul>	-		S	Yes	Table 9, 12 & 13	-	
			Geology	<ul style="list-style-type: none"> <li>It is not foreseen that the removal of indigenous vegetation will impact on the geology or vice versa.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-	
			Existing services infrastructure	<ul style="list-style-type: none"> <li>Generation of waste that need to be accommodated at a licensed landfill site.</li> <li>Generation of sewage that need to be accommodated by the local sewage plant.</li> </ul>	-		S	Yes	Table 16	-	
			Ground water	<ul style="list-style-type: none"> <li>Pollution due to construction vehicles.</li> </ul>	-		S	Yes	Table 14 & 15	-	
			Surface water	<ul style="list-style-type: none"> <li>Increase in storm water run-off.</li> <li>Pollution of water sources due to soil erosion.</li> <li>Destruction of watercourses (wetlands/pans).</li> </ul>	-		S	Yes	Table 9, 14 & 15	-	
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	<ul style="list-style-type: none"> <li>Job creation.</li> <li>Skills development.</li> </ul>			+	S	Yes	Table 22	Social Impact Assessment
			Visual landscape	<ul style="list-style-type: none"> <li>Potential visual impact on residents of farmsteads and motorists in close proximity to proposed facility.</li> </ul>	-		S	Yes	Table 28	-	
			Traffic volumes	<ul style="list-style-type: none"> <li>Increase in construction vehicles.</li> </ul>	-		S	Yes	Table 10	-	
			Health & Safety	<ul style="list-style-type: none"> <li>Air/dust pollution.</li> <li>Road safety.</li> <li>Increased crime levels. The presence of construction workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people in the rural area.</li> </ul>			-	S	Yes	Table 10 & 23	Social Impact Assessment
			Noise levels	<ul style="list-style-type: none"> <li>The generation of noise as a result of construction vehicles, and people working on the site.</li> </ul>	-		S	Yes	Table 10 & 19	-	



			Tourism industry	<ul style="list-style-type: none"> <li>Since there are no tourism facilities in close proximity to the site, the proposed activity will not have an impact on tourism in the area.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-
			Heritage resources	<ul style="list-style-type: none"> <li>Removal or destruction of archaeological sites.</li> <li>Removal or destruction of buildings, structures, places and equipment of cultural significance.</li> <li>Removal or destruction of graves, cemeteries and burial grounds.</li> </ul>		-	S	Yes	Table 26	Heritage Impact Assessment
<b>OPERATIONAL PHASE</b>										
<p><b>Activity 15 (Regulation 545):</b> "Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more."</p>	<p>The key components of the proposed project are described below:</p> <ul style="list-style-type: none"> <li><b>PV Panel Array</b> - To produce 84MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted at a northern angle in order to capture the most sun.</li> <li><b>Wiring to Central Inverters</b> - Sections of the PV array will be wired to central inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.</li> <li><b>Connection to the grid</b> - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite substation will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid. Whilst Kappa Solar Power Plant has not yet received a cost estimate letter from Eskom, it is expected that generation from the facility will either tie in with the Honesty Traction 132kV Substation, which is located approximately 90m from the site or the Bloemheuwel-Ganspan. Although the generation capacity is 84MW the capacity at the point of connection with Eskom will be 75MW.</li> </ul>	<b>BIOPHYSICAL ENVIRONMENT</b>	Fauna & Flora	<ul style="list-style-type: none"> <li>Fragmentation of habitats.</li> <li>Establishment and spread of declared weeds and alien invader plants (operations).</li> </ul>	-		L	Yes	Table 29, 33	-
			Air quality	<ul style="list-style-type: none"> <li>The proposed development will not result in any air pollution during the operational phase.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-
			Soil	<ul style="list-style-type: none"> <li>Soil degradation, including erosion.</li> <li>Disturbance of soils and existing land use (soil compaction).</li> <li>Loss of agricultural potential (low significance relative to agricultural potential of the site).</li> </ul>		-	L	Yes	Table 29, 31	Agricultural and Soils Impact Assessment
			Geology	<ul style="list-style-type: none"> <li>Collapsible soil.</li> <li>Seepage (shallow water table).</li> <li>Active soil (high soil heave).</li> <li>Erodible soil.</li> <li>Hard/compact geology. If the bedrock occurs close to surface it may present problems when driving solar panel columns.</li> <li>The presence of undermined ground.</li> <li>Instability due to soluble rock.</li> <li>Steep slopes or areas of unstable natural slopes.</li> <li>Areas subject to seismic activity.</li> <li>Areas subject to flooding.</li> </ul>		-	S	Yes	Table 31	Geotechnical Study as part of the Agricultural and Soils Impact Assessment
			Existing services infrastructure	<ul style="list-style-type: none"> <li>Generation of waste that need to be accommodated at a licensed landfill site.</li> <li>Generation of sewage that need to be accommodated by the municipal sewerage system and the local sewage plant.</li> <li>Increased consumption of water. Approximately 3,000,000 liters of water per annum will be required for the operation of the solar plant.</li> </ul>		-	L	Yes	Table 34, 35	Confirmation from the Local Municipality
			Ground water	<ul style="list-style-type: none"> <li>Leakage of hazardous materials. The development will comprise of a distribution substation and will include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies.</li> </ul>	-		L	Yes	Table 32	-
			Surface water	<ul style="list-style-type: none"> <li>Increase in storm water runoff. The development will potentially result in an increase in storm water runoff that needs to be managed to prevent soil erosion.</li> <li>Leakage of hazardous materials. The development will comprise of a distribution substation and will</li> </ul>		-	L	Yes	Table 32	Wetland assessment as part of the ecological fauna and flora habitat survey

<ul style="list-style-type: none"> <li><u>Supporting Infrastructure</u> - A control facility with basic services such as water and electricity will be constructed on the site and will have an approximate footprint 400m<sup>2</sup>. Other supporting infrastructure includes voltage and current regulators and protection circuitry.</li> <li><u>Roads</u> – Access to the site will be obtained from a local gravel road off the (N12) National Road. However an internal site road network to provide access to the solar field and associated infrastructure will be required. All site roads will require a width of approximately 4m.</li> <li><u>Fencing</u> - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.</li> </ul>	SOCIAL/ECONOMIC ENVIRONMENT		include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies.						
		Local unemployment rate	<ul style="list-style-type: none"> <li>Job creation. Security guards will be required for 24 hours every day of the week and general laborers will also be required for the cleaning of the panels.</li> <li>Skills development.</li> </ul>		+	L	Yes	Table 37	Social Impact Assessment
		Visual landscape	<ul style="list-style-type: none"> <li>Change in land-use/sense of place. The site is characterized by open veldt with a rural agricultural sense of place. The use of the area for the construction and operation of the PV plant will result in the area not being used for livestock grazing anymore.</li> <li>Potential visual impact on residents of farmsteads and travellers in close proximity to proposed facility.</li> </ul>		-	L	Yes	Table 36	Visual Impact Assessment
		Traffic volumes	<ul style="list-style-type: none"> <li>The proposed development will not result in any traffic impacts during the operational phase.</li> </ul>	-		L	Yes	No mitigation required	-
		Health & Safety	<ul style="list-style-type: none"> <li>The proposed development will not result in any health and safety impacts during the operational phase.</li> </ul>	N/A	N/A	N/A	N/A	Table 35	-
		Noise levels	<ul style="list-style-type: none"> <li>The proposed development will not result in any noise pollution during the operational phase.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-
		Tourism industry	<ul style="list-style-type: none"> <li>Enhance tourism in the area. The facility may become an attraction or a landmark within the region that people would want to come and see.</li> </ul>	+		L	Yes	No mitigation required	-
		Heritage resources	<ul style="list-style-type: none"> <li>It is not foreseen that the proposed activity will impact on heritage resources or vice versa.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-
		Electricity supply	<ul style="list-style-type: none"> <li>Generation of additional electricity. The facility will generate electricity that will be fed into the grid.</li> </ul>	+		L	Yes	No mitigation required	-
		Local community	<ul style="list-style-type: none"> <li>The establishment of a Community Trust.</li> </ul>		+	L	Yes	Table 38	Social Impact Assessment
		Electrical infrastructure	<ul style="list-style-type: none"> <li>Additional electrical infrastructure. The proposed solar facility will add to the existing electrical infrastructure and aid to lessen the reliance of electricity generation from coal-fired power stations.</li> </ul>	+		L	Yes	No mitigation required	-

**DECOMMISSIONING PHASE**

<ul style="list-style-type: none"> <li><u>Dismantlement of infrastructure</u> During the decommissioning phase the Solar PV Energy facility and its associated infrastructure will be dismantled.</li> <li><u>Rehabilitation of biophysical environment</u> The biophysical environment will be rehabilitated.</li> </ul>	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> <li>Re-vegetation of exposed soil surfaces to ensure no erosion in these areas.</li> </ul>	+		L	Yes	Table 43	-
		Air quality	<ul style="list-style-type: none"> <li>Air pollution due to the increase of traffic of construction vehicles.</li> </ul>	-		S	Yes	Table 44	-
		Soil	<ul style="list-style-type: none"> <li>Soil degradation, including erosion.</li> <li>Disturbance of soils and existing land use (soil compaction).</li> <li>Physical and chemical degradation of the soils by construction vehicles (hydrocarbon spills).</li> </ul>	-		S	Yes	Table 42	-
		Geology	<ul style="list-style-type: none"> <li>It is not foreseen that the decommissioning phase will impact on the geology of the site or vice versa.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-
		Existing services infrastructure	<ul style="list-style-type: none"> <li>Generation of waste that need to be accommodated at the local landfill site.</li> <li>Generation of sewage that need to be</li> </ul>	-		S	Yes	Table 41	-

			accommodated by the municipal sewerage system and the local sewage plant.						
			<ul style="list-style-type: none"> <li>Increase in construction vehicles.</li> </ul>						
		Ground water	<ul style="list-style-type: none"> <li>Pollution due to construction vehicles.</li> </ul>	-		S	Yes	Table 42	-
		Surface water	<ul style="list-style-type: none"> <li>Increase in storm water run-off.</li> <li>Pollution of water sources due to soil erosion.</li> <li>Destruction of watercourses (wetlands/pans).</li> </ul>	-		S	Yes	Table 42	-
		Local unemployment rate	<ul style="list-style-type: none"> <li>Loss of employment.</li> </ul>		-	L	Yes	Table 39	Social Impact Assessment
		Visual landscape	<ul style="list-style-type: none"> <li>Potential visual impact on visual receptors in close proximity to proposed facility.</li> </ul>	-		S	Yes	Table 47	-
		Traffic volumes	<ul style="list-style-type: none"> <li>Increase in construction vehicles.</li> </ul>	-			Yes	Table 46	-
		Health & Safety	<ul style="list-style-type: none"> <li>Air/dust pollution.</li> <li>Road safety.</li> <li>Increased crime levels. The presence of construction workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people in the rural area.</li> </ul>	-			Yes	Table 40	-
		Noise levels	<ul style="list-style-type: none"> <li>The generation of noise as a result of construction vehicles, the use of machinery and people working on the site.</li> </ul>	-			Yes	Table 45	-
		Tourism industry	<ul style="list-style-type: none"> <li>Since there are no tourism facilities in close proximity to the site, the decommissioning activities will not have an impact on tourism in the area.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-
		Heritage resources	<ul style="list-style-type: none"> <li>It is not foreseen that the decommissioning phase will impact on any heritage resources.</li> </ul>	N/A	N/A	N/A	N/A	N/A	-

(N/A) No impact (+) Positive Impact (-) Negative Impact (S) Short Term (M) Medium Term (L) Long Term

## 5.7 Key issues identified

From the above it is evident that mitigation measures should be available for potential impacts associated with the development.

### 5.7.1 Impacts during the construction phase

During the construction phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 10(i) (Regulation 544): *"The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 1 (Regulation 545): *"The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."*
- Activity 15 (Regulation 545): *"Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more."*
- Activity 14(a)(i) (Regulation 546): *"The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation- (a) North West Province (i) All areas outside urban areas."*

During the construction phase minor negative impacts are foreseen over the short term. The latter refers to a period of months. The potentially most significant impacts relate to the impacts on the fauna and flora, soil, geology, existing services infrastructure, socio-economic impacts such as the provision of temporary employment and other economic benefits, increase in construction vehicle traffic, and the impacts on heritage resources.

### 5.7.2 Impacts during the operational phase

During the operational phase the study area will serve as a solar PV energy facility and the potential negative impacts relate to activity 15 (Regulation 545): *"Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more."* The potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with impacts on the soils, geology, surface water (wetlands/pans and storm water), the increased consumption of water, and visual impacts. The provision of sustainable services delivery also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community.

### 5.7.3 Impacts during the decommissioning phase

In the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. However the physical environment will benefit from the closure of the solar facility since the site will be restored to its natural state. The decommissioning phase will however result in the loss of permanent employment. However, skilled staff will be eminently employable and a number of temporary jobs will also be created in the process.

#### 5.7.4 Cumulative impacts

Cumulative impacts could arise if other similar projects are constructed in the area. According to the Department's database two other solar PV plant has been proposed within the Lekwa-Teemane Local Municipality, namely the Solar Energy Facility on Hartebeestpan Farm, Christiana PV 2 (75mw) (DEA/EIA/0000924/2012) and the proposed Delta Photovoltaic Solar Energy Facility near Bloemhof, North West Province (DEA Reference: 14/12/16/3/3/2/669).

The Solar Energy Facility on Hartebeestpan Farm (DEA/EIA/0000924/2012) is located approximately 8.5km north east of the site. The Delta project is located more than 65km from the Kappa site – refer to figure 9.

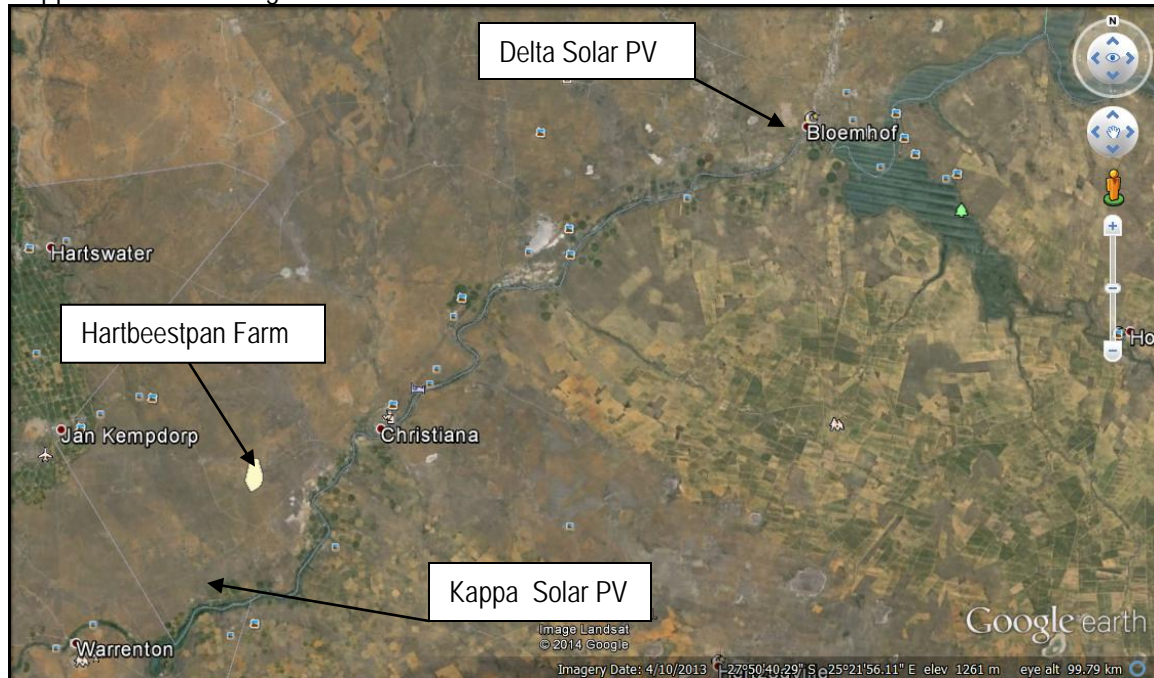


Figure 9: Similar projects in the area

The Visual Impact Assessment (Sandham, 2014:23) confirmed that given the relatively flat topography of this region, the entire site is usually visible only from a greater distance, i.e. more than 2 km, and will then impact largely on railway travellers and motorists. Given the location of the sites relative to each other and the distances between them the potential for cumulative impacts associated with combined visibility (whether two or more solar facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more solar facilities along a single journey, e.g. road or walking trail) is rated as medium. The potential cumulative impacts will be considered during the significance rating of the potential impacts (refer to Section 5.12 of this report).

However, the potential impact of solar facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of solar plant applications. As indicated above, a number of facilities have been proposed in the NWP. The North West Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications.

In addition to the potential negative impacts, the establishment of the proposed Kappa Solar Power Plant and other facilities in the LTLM also has the potential to create a number of socio-economic opportunities for the Lekwa-Teemane Local Municipality and Dr. Ruth Segomotsi Mompati District Municipality, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities.

It should be noted that at this stage, the number of facilities that will actually be established in the broader area is unclear as this is dependent on each project being selected by the Department of Energy through a competitive tendering process. Prior to construction these facilities are still required to obtain a number of licenses and approvals in terms of South African Legislation.

## **5.8 Environmental assessment of significant issues**

The following sections summarise the key findings from the specialist reports after which an assessment is conducted on the significance of the key issues. The mitigation measures related to the key issues are highlighted or reference is made to the mitigation measures set out by the EMPr. This section concludes by pointing out the remaining gaps in knowledge and uncertainties in results, which need to be considered during final recommendations.

It needs to be stressed that although these issues were identified as potentially significant it does not imply that they are significant. Establishing the significance of these issues is exactly the purpose of the EIA phase. It also needs to be highlighted that the significance assessment and rating is based on conditions after mitigation and not based on the baseline scenario without mitigation.

### **5.8.1 Summary of recommendations from specialist studies**

To address the key issues highlighted in the previous section the following specialist studies and processes were commissioned:

- A Heritage Impact Assessment - conducted by Mr. J.A. van Schalkwyk (see Appendix D2).
- An ecological fauna and flora habitat survey and brief Wetland Assessment - conducted by Anthene Ecological CC (see Appendix D3).
- A visual impact assessment - conducted by Dr. L. A. Sandham (see Appendix D4).
- Agricultural and Soils Assessment and a brief geotechnical assessment – conducted by Johann Lanz Soil Specialist (see Appendix D5).
- Social Impact Assessment - conducted by Tony Barbour Environmental Consulting and Research (see Appendix D6).
- A detailed assessment of the cumulative impacts associated with the proposed development – conducted by the lead consultant, Environamics (refer to Section 5.12 of this report).

The following sections summarise the main findings from the specialist reports in relation to the key issues raised during the scoping phase.

### 5.8.1.1 Issue 1: Geotechnical suitability

The geotechnical suitability of the site for the proposed development needed to be determined. The main question which needs to be addressed is:

*"Are the geotechnical conditions favorable for the development of a PV solar plant?"*

Agricultural and Soils Assessment (see Appendix D5), which included a brief geotechnical assessment highlighted the following for geotechnical purposes:

- Soil cover is continuous across the site and is likely to be 1.2 or more metres thick throughout.
- Vertic soils (swelling clays) of the Rensburg soil form occur at one place on the site.
- Perched surface water is likely to occur in the pan feature, after sufficient rain.

According to the specialist the site should be regarded as suitable for the proposed development. It is however recommended that a detailed engineering geological investigation be conducted prior to construction and that site-specific precautionary measures be implemented.

### 5.8.1.2 Issue 2: Heritage and archeological impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. In accordance with Section 38 of the NHRA, an independent heritage consultant was therefore to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the proposed site. The main question which needs to be addressed is:

*"Will the proposed development impact on any heritage or archeological artifacts?"*

The Heritage Impact Assessment (Refer to Appendix D2) concluded that an old farmstead consisting of a main house as well as some outbuildings (milk shed, store rooms, etc.) have been identified in the study area. A date of 1921 was added above the front door.

The Heritage Impact Assessment (Refer to Appendix D2) stated that: *According to current understanding of the proposed development, this site would be impacted on by the proposed development. It is recommended that if the farmstead cannot be avoided, it should be documented (mapped and photographed) in full before development takes place. If that is not possible, a buffer zone of at least 20 metres should be demarcated around the site. This can be determined from the last visible feature identified as forming part of the larger farmstead settlement unit."*

### 5.8.1.3 Issue 3: Ecological Impacts

The potential impact of the proposed development on threatened flora and fauna known to occur in North West Province had to be determined. The main question which needs to be addressed is:

*"How will the proposed development impact on the ecology?"*

The fauna and flora ecological study (refer to Appendix D3) confirmed that the visible ecological disturbance at the site are reflected by conspicuous abundance of pioneer plant species and bare areas at hitherto cultivated fields at the central and eastern parts of the site. At the western parts of the site disturbances appear to be moderate though the presence of exotic tree species such as *Eucalyptus camaldulensis* (Red River Gum) and some trampling near water point and in some areas are visible. Some of these disturbances are normal for a managed grazing system. Important is that the footprint proposed for the development is located at an area with relatively low microhabitat diversity. It is to be commended that the proposed footprint in the larger area has been chosen so that conspicuous sensitive areas such as rocky ridges, wetlands or areas with particular high microhabitat diversity have been avoided.

There is a very small wetland area at the western extremes of the footprint proposed for the development. It should be noted that this wetland is poorly defined both in terms of hydrophytic vegetation and also in terms of soil indicators. This restricted wetland area is identified as a precaution. For perspective this small wetland area cannot be regarded as similar to unique salt pans in the larger area (region), of which the small wetland area is not nearly as significant or unique.

It is unlikely that connectivity and important conservation corridors in the area would be significantly impacted. No loss of particularly sensitive habitat of particular conservation importance is anticipated if the site is developed. Loss of any plant or animal species of particular high conservation priority i.e. threatened or near threatened species, if the site is developed, is highly unlikely.

#### **5.8.1.4 Issue 4: Visual Impacts**

Due to the extent of the proposed photovoltaic solar plant (285 hectares) it is expected that the plant will result in potential visual impacts. The main question which needs to be addressed is:

*"To what extent will the proposed development be visible to observers and to will the landscape provides any significant visual absorption capacity"*

The Visual Impact Assessment (Refer to Appendix D4) concluded that the construction and operation of the Proposed Kappa PV Solar Energy Facility and its associated infrastructure will have a limited visual impact on the visual environment within 2 km of the proposed facility. In view of the moderately low visual value of this landscape, the small numbers of sensitive receptors, and the strategic importance of developing sustainable energy alternatives, the significance of the overall visual impact of this development can be regarded as low. It is recommended that the development of the facility as proposed be supported, subject to the implementation of the recommended mitigation measures and management actions.

#### **5.8.1.5 Issue 5: Agricultural / impacts on the soil**

In order to determine the potential impacts that the proposed development will have on agricultural production, the soil forms and current land capability of the area where the proposed project will be situated an agricultural and soils survey has been conducted. The main question which needs to be addressed is:



*"How will the proposed development impact on agricultural resources and the soil?"*

Based on the findings of the Agricultural and Soils Impact Assessment (refer to Appendix D5) there are three potential negative impacts on agricultural resources and productivity:

- Loss of agricultural land use caused by direct occupation of land by the energy facility footprint.
- Loss of topsoil in disturbed areas, causing a decline in soil fertility.
- Soil Erosion caused by alteration of the surface characteristics.

The generation of alternative land use income through rental for energy facility was identified as a potential positive impact on agricultural resources and productivity. The proposed development will provide the farming enterprise with increased cash flow and rural livelihood. From the study it is evident that with proper mitigation measures all impacts can be reduced to low level.

#### **5.8.1.6 Issue 6: Socio-economic impacts**

A Social Impact Assessment has been compiled in order to provide a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility; to provide a description and assessment of the potential social issues associated with the proposed facility; and the identification of enhancement and mitigation aimed at maximizing opportunities and avoiding and or reducing negative impacts (refer to Appendix D6). The main question which needs to be addressed is:

*"How will the proposed development impact on the socio-economic environment?"*

The findings of the SIA (Refer to Appendix D6) indicate that the development of the proposed Kappa Solar Power Plant will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. In addition, the proposed establishment of a number of renewable energy facilities in the Lekwa-Teemane Local Municipality and North West Province will create socio-economic opportunities, which, in turn, will result in a positive social benefit.

The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The establishment of the proposed Kappa Solar Power Plant is therefore supported by the findings of the SIA.

However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities when considering other applications.

### 5.8.1.7 Issue 7: Impacts on the wetland/pans

In order to determine the potential impacts that the proposed development will have on wetlands and/or pans in the area where the proposed project will be situated a brief wetland assessment has been conducted. The main question which needs to be addressed is:

*"How will the proposed development impact on water resources (wetlands/pans) and vice versa?"*

The brief wetland assessment as part of the fauna and flora ecological study (refer to Appendix D3) confirmed that no wetlands are present at the site, apart from one small poorly defined wetland flat at the western part of the site. There is a very small wetland area at the western extremes of the footprint proposed for the development. It should be noted that this wetland is poorly defined both in terms of hydrophytic vegetation and also in terms of soil indicators. This restricted wetland area is identified as a pre-caution. For perspective this small wetland area cannot be regarded as similar to unique salt pans in the larger area (region), of which the small wetland area is not nearly as significant or unique.

### 5.8.1.8 Issue 8: Addressing cumulative impacts

The main question which needs to be addressed is:

*"How will the cumulative impacts resulting from the proposed facility be managed?"*

The potential cumulative impacts were considered during the significance rating of the potential impacts (refer to Section 5.12 of this report). The significance of these were considered to be of low to medium negative (-) significance and low to medium positive (+), without mitigation. These potential cumulative impacts would decrease, with implementation of mitigation measures for the proposed project as well as other proposed projects in the area, and are considered to be acceptable. It should however be noted that it is not possible to assess these cumulative impacts in a project specific EIA, not least because not all the proposed projects in the area may be approved or constructed.

## 5.9 Method of environmental assessment

The environmental assessment aims to identify the various possible environmental impacts that could result from the proposed development. Different impacts need to be evaluated in terms of their significance and in doing so highlight the most critical issues to be addressed.

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 5.3.

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.

## 5.9.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- 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 should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

**Table 5.3: The rating system**

<b>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.		
<b>GEOGRAPHICAL EXTENT</b>		
This is defined as the area over which the impact will be experienced.		
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</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>DURATION</b>		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact 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 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 – 30 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 indefinite.
<b>INTENSITY/ MAGNITUDE</b>		
Describes the severity of an impact.		
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. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
<b>REVERSIBILITY</b>		
This describes the degree to which an impact 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</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>CUMULATIVE EFFECT</b>		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
<b>SIGNIFICANCE</b>		
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. The calculation of the significance of an impact uses the following formula:  (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) 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
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	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".
74 to 96	Positive very high impact	The anticipated impact will have highly significant

## 5.10 Consideration of cumulative impacts

Section 2 of the NEMA requires the consideration of cumulative impacts as part of any environmental assessment process. The EIA Regulations (2010) determine that cumulative impacts, *“in relation to an activity, 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.”* Cumulative impacts can be incremental, interactive, sequential or synergistic. EIAs have traditionally failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires coordinated institutional arrangements;
- Complexity - dependent on numerous fluctuating influencing factors which may be completely independent of the controllable actions of the proponent or communities; and
- Project level investigations are ill-equipped to deal with broader biophysical, social and economic considerations.

Despite these challenges, cumulative impacts have been afforded increased attention in this EIR and for each impact a separate section has been added which discusses any cumulative issues, and where applicable, draws attention to other issues that may contextualise or add value to the interpretation of the impact. Finally, comment is provided on the potential cumulative impacts which could result should this development, and others like it in the area, be approved.

## 5.11 Description of uncertainties and gaps in knowledge

The uncertainties in results are mostly related to the availability of information, time available to gather the relevant information as well as the sometimes subjective nature of the assessment methodology. In terms of addressing the key issues the EAP is satisfied that there are no major gaps in knowledge and that the specialist reports provide sufficient information to conduct the significance rating and provide the environmental authority with sufficient information to make an informed decision.

## 5.12 Significance of potential impacts

The following sections present the outcome of the significance rating exercise. The results suggest that almost none of the key issues identified as part of the scoping process had a negative high environmental significance. Instead the overall score indicate a low environmental significance score.

### 5.12.1 Impacts that may result from the construction phase

**Direct impacts:** During the construction phase minor negative impacts are foreseen over the short term. The latter refers to a period of months. The installation of services may result in the loss or fragmentation of indigenous natural fauna and flora, loss or fragmentation of habitats, , impacts of the geology on the proposed development, soil erosion, hydrology, temporary noise disturbance, generation of waste, impacts on heritage objects, visual intrusions, increase in construction vehicle traffic, impact of construction workers on local communities, influx of job seekers, risk to safety,

livestock and farm infrastructure, and increased risk of veld fires. It is obvious that the construction phase will also have a direct positive impact through the provision of employment opportunities for its duration and technical advice for local farmers and municipalities. The abovementioned impacts are discussed in more detail below:

- Loss or fragmentation of indigenous natural fauna and flora –

In terms of vegetation type the site falls within the Kimberley Thornveld vegetation type (Mucina and Rutherford, 2006). The Kimberley Thornveld vegetation type is described by Mucina and Rutherford (2006) as 'least threatened'. The ecological habitat survey (refer to Appendix D3) confirmed that there is little scope for corridors of particular conservation importance at the footprint though the wetland area could act as an important part of a stepping stone type conservation corridor. Loss of any plant or animal species of particular high conservation priority i.e. threatened or near threatened species, if the site is developed, is highly unlikely. A very large part of the proposed footprint has very few trees and consists mainly of secondary or disturbed grass layer. Most conspicuous indigenous tree species include *Acacia tortilis* (Umbrella Thorn) and *Acacia hebeclada*. Much of the grass layer especially at areas that have hitherto been cultivated appears to have a high proportion of pioneer species such as *Aristida congesta*. *Eragrostis rigidior* (curly leaf) is also particularly common at the proposed footprint. Because of open areas and also sandy soil in certain areas trailing plant species such as *Senna italica* subsp. *arachoides* are also present. It is to be commended that the proposed footprint in the larger area has been chosen so that conspicuous sensitive areas such as rocky ridges, wetlands or areas with particular high microhabitat diversity have been avoided. The ecological habitat survey (refer to Appendix D3) confirmed also confirmed that although some bird species that roams over large areas may occasionally be found at the site, the site does not appear to be a habitat of particular importance to these birds, and these birds also do not use the site as breeding area. Therefore no threat to any threatened bird species or any bird species of particular conservation importance are foreseen and no further studies have been conducted.

Loss or fragmentation of indigenous natural fauna and flora	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Low (1)	Low (1)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impact (2), since the condition of the natural vegetation appears to be moderate.	
<b>Significance</b>	<b>Negative low (16)</b>	<b>Negative low (16)</b>
Can impacts be mitigated?	<p>If the development is approved, contractors must ensure that no animal species are disturbed, trapped, hunted or killed during the construction phase. The EMPr also provides numerous mitigation measures – refer to table 17 and 18 of the EMPr Appendix F.</p> <p>The potential impacts associated with damage to and loss of farmland should be effectively mitigated. The aspects that should be covered include:</p> <ul style="list-style-type: none"> <li>• The site should be fenced off prior to</li> </ul>	

	<p>commencement of construction activities;</p> <ul style="list-style-type: none"> <li>• The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be confined to the fenced off area and minimised where possible;</li> <li>• An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;</li> <li>• All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;</li> <li>• The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. Specifications for the rehabilitation are provided throughout the EMPr – refer to Appendix F.</li> <li>• The implementation of the Rehabilitation Programme should be monitored by the ECO.</li> </ul>
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- Loss or fragmentation of habitats – Given the low probability of resident threatened species occurring at the footprint site, the low probability of any significant conservation corridor or buffer zone at the footprint site, the absence of any significant wetland feature or rocky ridge habitats of particular conservation concern at the footprint site, the site proposed for development could be viewed as less sensitive in the region (refer to Appendix D3 for the fauna and flora ecological habitat survey).

Loss or fragmentation of habitats	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Permanent (4)	Permanent (4)
Magnitude	Low (1)	Low (1)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impact (2), since these types of developments is not located on ecological sensitive areas.	
<b>Significance</b>	<b>Negative low (15)</b>	<b>Negative low (9)</b>
Can impacts be mitigated?	Exotic and invasive plant species should not be allowed to establish, if the development is approved. Where exotic and invasive plant species are found at the site continuous eradication should take place. If the development is approved, every effort should be made to confine the footprint to the blocks allocated for	



	development and have the least possible edge effects on the ecosystem. Table 17 and 18 in the EMPr also provides numerous mitigation measures related to flora—refer Appendix F.
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- Loss of topsoil – Topsoil may be lost due to poor topsoil management (burial, erosion, etc.) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) The effect will be the loss of soil fertility on disturbed areas after rehabilitation (Refer to Appendix D5 for the Agricultural and Soils Impact Assessment).

Loss of topsoil	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Geographical extent	Site (1)	Site (1)
Probability	Possible (2)	Unlikely (1)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Marginal (2)	Marginal (2)
Cumulative impact	Negligible cumulative impact (1).	
<b>Significance</b>	<b>Negative low (22)</b>	<b>Negative low (20)</b>
Can impacts be mitigated?	<p>The Agricultural and Soils Impact Assessment (refer to Appendix D5) provides the following mitigation or management measures:</p> <ul style="list-style-type: none"> <li>• If an activity will mechanically disturb below surface in any way, then any available topsoil should first be stripped from the entire surface and stockpiled for re-spreading during rehabilitation.</li> <li>• Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.</li> <li>• Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.</li> <li>• During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.</li> <li>• Erosion must be controlled where necessary on top soiled areas.</li> </ul> <p><u>Monitoring</u> Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.</p>	

	<ul style="list-style-type: none"> <li>Record the GPS coordinates of each area.</li> <li>Record the date of topsoil stripping.</li> <li>Record the GPS coordinates of where the topsoil is stockpiled.</li> <li>Record the date of cessation of constructional (or operational) activities at the particular site.</li> <li>Photograph the area on cessation of constructional activities.</li> <li>Record date and depth of re-spreading of topsoil.</li> <li>Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</li> </ul> <p>Table 12 in the EMPr also provides mitigation measures related to topsoil management – refer Appendix F. General guidelines for management of soils are also provided in Annexure B to the EMPr.</p>
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- Impacts of the geology on the proposed development – A brief geotechnical assessment was conducted in order to determine the site’s suitability for the proposed development of a photovoltaic plant. The results of the assessment reveal that the soil cover is continuous across the site and is likely to be 1.2 or more metres thick throughout. Vertic soils (swelling clays) of the Rensbiurg soil form occur at one place on the site. Perched surface water is likely to occur in the pan feature, after sufficient rain. According to the specialist the site should be regarded as suitable for the proposed development – refer to Appendix D5.

Geological impacts	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Probable (3)	Probable (3)
Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	Medium (2)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Negligible cumulative impact (1).	
<b>Significance</b>	<b>Negative low (16)</b>	<b>Negative low (16)</b>
Can impacts be mitigated?	<p>It is recommended that a detailed engineering geological investigation be conducted prior to construction and that site-specific precautionary measures be implemented.</p> <p>Table 12 in the EMPr also provides mitigation measures related to the geology of the site – refer Appendix F.</p>	

- Soil erosion – Soil erosion due to alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, presence of panel surfaces, and the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources. The erosion risk is low due to the low slope gradients and low to moderate erodibility of the soils. (Refer to Appendix D5 for the Agricultural and Soils Impact Assessment).

Soil erosion	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Geographical extent	Site (1)	Site (1)
Probability	Possible (2)	Unlikely (1)
Duration	Medium term (2)	Medium term (2)
Magnitude	Medium (2)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Marginal (2)	Marginal (2)
Cumulative impact	Negligible cumulative impact (1).	
<b>Significance</b>	<b>Negative low (20)</b>	<b>Negative low (18)</b>
Can impacts be mitigated?	<p>The Agricultural and Soils Impact Assessment (refer to Appendix D5) provides the following mitigation or management measures: Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.</p> <p>Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.</p> <p>Table 13 in the EMPr also provides mitigation measures related to the erosion of the site – refer Appendix F.</p>	

- Impacts on the sites hydrology – The ecological habitat survey (refer to Appendix D3) confirmed that there is a very small wetland area at the western extremes of the footprint proposed for the development. It should be noted that this wetland is poorly defined both in terms of hydrophytic vegetation and also in terms of soil indicators. This restricted wetland area is identified as a pre-caution. For perspective this small wetland area cannot be regarded as similar to unique salt pans in the larger area (region), of which the small wetland area is not nearly as significant or unique.

Hydrological impacts	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Possible (2)	Unlikely (1)

Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	Low (1)
Reversibility	Barely reversible (3)	Barely reversible (3)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impact (2). Should these impacts occur, there may be a cumulative impact on the hydrology of the area.	
<b>Significance</b>	<b>Negative low (20)</b>	<b>Negative low (9)</b>
Can impacts be mitigated?	The EMPr provides mitigation measures for the management of surface and groundwater – refer to tables 9, 14, and 15 of the EMPr in Appendix F.	

- Temporary noise disturbance - Construction activities will result in the generation of noise over a period of months. Sources of noise are likely to include vehicles, the use of machinery such as drills and people working on the site. The noise impact is unlikely to be significant; but construction activities should be limited to normal working days and hours (7:00 – 17:00).

Temporary noise disturbance	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Probable (3)
Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	Low (1)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	The impact would result in negligible to no cumulative effects (1).	
<b>Significance</b>	<b>Negative low (20)</b>	<b>Negative low (9)</b>
Can impacts be mitigated?	Yes, management actions related to noise pollution are included in tables 10 and 19 of the EMPr.	

- Generation of waste - general waste, construction waste, sewage and grey water - The workers on site are likely to generate general waste such as food wastes, packaging, bottles, etc. Construction waste is likely to consist of packaging, scrap metals, waste cement, etc. The applicant will need to ensure that general and construction waste is appropriately disposed of i.e. taken to the nearest licensed landfill. Sufficient ablution facilities will have to be provided, in the form of portable/VIP toilets. No pit latrines, French drain systems or soak away systems shall be allowed.

Generation of waste	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local/district (2)	Local/district (2)
Probability	Definite (4)	Definite (4)

Duration	Short term (1)	Short term (1)
Magnitude	Low (1)	Low (1)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Medium cumulative impact (3) - An additional demand for landfill space could result in significant cumulative impacts if services become unstable or unavailable, which in turn would negatively impact on the local community.	
<b>Significance</b>	<b>Negative medium (13)</b>	<b>Negative low (13)</b>
Can impacts be mitigated?	Yes, it is therefore important that all management actions and mitigation measures included in the EMPr are implemented – refer to table 16.	

- Impacts on heritage objects – In accordance with Section 38 of the NHRA, an independent heritage consultant was therefore appointed to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where it is planned to develop the photovoltaic power plant. An old farmstead consisting of a main house as well as some outbuildings (milk shed, store rooms, etc.) have been identified in the study area. A date of 1921 was added above the front door. From the variety of material used in constructing the different rooms - dressed stone, sundried brick and fired bricks - it is deduced that the main structure was built in different phases. The roof as well as all the fitting has been removed and only the walls remain. These are in a bad state of repair and most are in the process of collapsing. The various outbuildings are totally in ruins and only vague outlines of the foundations remain. The garden consists of a number of large exotic trees (palms, Jacaranda, blue-gum, etc.). No graves were identified in the vicinity of the farmstead.

Impacts on heritage objects	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Possible (2)
Duration	Permanent (5)	Medium term (2)
Magnitude	High (3)	Low (1)
Reversibility	Reversible (3)	Reversible (3)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impact (2).	
<b>Significance</b>	<b>Negative high (54)</b>	<b>Negative low (13)</b>
Can impacts be mitigated?	Yes the impact can be mitigated. It is recommended that if the farmstead cannot be avoided, it should be documented (mapped and photographed) in full before development takes place. If that is not possible, a buffer zone of at least 20 metres should be demarcated around the site. Also refer to the mitigation measures provided in table 26 of the EMPr – Appendix F.	

- Temporary employment and other economic benefits (business opportunities and skills development) – Approximately 450 temporary job opportunities will be created to undertake the construction activities. It is likely that local construction companies with the necessary expertise to construct solar facilities will be partnered with. The construction period is expected to extend over a period of 18-24 months. During this period security personnel will also be required to work at the site particularly after working hours. It is also likely that some materials such as fencing, and other construction related consumables will be sourced locally.

Temporary employment and other economic benefits	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Province (3)	Province (3)
Probability	Definite (4)	Definite (4)
Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	High (3)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	Medium cumulative impact (3) - The community will have an opportunity to better their social and economic well being, since they will have the opportunity to upgrade and improve skills levels in the area.	
Significance	<b>Positive Medium (30)</b>	<b>Positive Medium (45)</b>
Can impacts be mitigated?	<p>In order to enhance local employment and business opportunities associated with the construction phase the following measures should be implemented:</p> <p><u>Employment</u></p> <ul style="list-style-type: none"> <li>• Where reasonable and practical Kappa Solar Power Plant should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area;</li> <li>• Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;</li> <li>• Before the construction phase commences Kappa Solar Power Plant should meet with representatives from the LTLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.</li> <li>• The local authorities, community</li> </ul>	

	<p>representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Kappa Solar Power Plant intends following for the construction phase of the project.</p> <ul style="list-style-type: none"> <li>• Where feasible a training and skills development programmes for local workers should be initiated prior to the initiation of the construction phase.</li> <li>• The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.</li> </ul> <p><u>Business</u></p> <ul style="list-style-type: none"> <li>• Kappa Solar Power Plant should liaise with the LTLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;</li> <li>• Where possible, Kappa Solar Power Plant should assist local BBBEE companies to complete and submit the required tender forms and associated information.</li> <li>• The LTLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.</li> </ul> <p>Also refer to table 22 of the EMPr for mitigation measures related to employment.</p>
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- Visual intrusion -The Visual Impact Assessment (Refer to Appendix D4) concluded that the construction and operation of the Proposed Beta PV Solar Energy Facility and its associated infrastructure will have a limited visual impact on the visual environment within 2km of the proposed facility. In view of the moderately low visual value of this landscape, the small numbers of sensitive receptors, and the strategic importance of developing sustainable energy alternatives, the significance of the overall visual impact of this development can be regarded as low.

Visual intrusion	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Short term (2)	Short term (2)
Magnitude	High (3)	Low (1)
Reversibility	Recoverable (2)	Recoverable (1)
Irreplaceable loss of resources	No loss of resources (1)	No loss of resources (2)
Cumulative impact	Low cumulative impact (2). The construction of the PV plant and ancillary infrastructure may eventually increase the cumulative visual impact of industrial type infrastructure within the region. This is not yet relevant in light of relatively low level occurrence of such infrastructure in this area.	
Significance	<b>Negative medium (33)</b>	<b>Negative low (12)</b>
Can impacts be mitigated?	<p>Yes, mitigation measures are included in the visual impact assessment study and table 28 of the EMPr. The VIA states that there is good screening opportunity since the land is slightly elevated, relatively flat and with isolated to sparsely scattered trees and bushes. Generation of dust will increase the visibility of the project, and it is therefore important to employ techniques to suppress dust generation during construction. Measures include:</p> <ul style="list-style-type: none"> <li>• Dust suppression is important as dust will raise the visibility of the development.</li> <li>• New road construction should be minimised and existing roads should be used where possible.</li> <li>• The contractor should maintain good housekeeping on site to avoid litter and minimise waste.</li> <li>• Although there are no readily erodible slopes on the site, erosion risks should be assessed and minimised as erosion scarring can create areas of strong visual contrast with the surrounding vegetation, which can often be seen from long distances since they will be exposed against the undisturbed background.</li> <li>• Mitigation of lighting impacts includes the proactive design, planning and specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for the PV plant and</li> </ul>	



	<p>the ancillary infrastructure will go far to contain rather than spread the light.</p> <ul style="list-style-type: none"> <li>• Fires and fire hazards need to be managed appropriately.</li> <li>• Screening should be implemented by erection of the security fence, and by retaining existing and establishing ecologically appropriate additional vegetation. The growth of vegetation will improve screening into the operational phase.</li> </ul> <p>Also refer to table 28 of the EMPr for mitigation measures related to the visual impact of construction activities.</p>
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**Indirect impacts:** The nuisance aspects generally associated with the installation of infrastructure will also be applicable to this development, which relates primarily to the increase in construction vehicle traffic.

- Technical advice for local farmers and municipalities - The establishment of a Solar PV plant in the area creates an opportunity for the technical staff involved in the project to provide local farmers in the area with advice regarding the installation of solar energy technology to supplement their current and future energy needs. A number of farmers indicated that they would appreciate assistance in this regard in the form of expert opinion as to what type of solar technologies would be best suited to meet their needs and how best to install solar energy installations on their farms. This could be achieved via a workshop / discussion with the local farmers in the area. Local municipalities would also benefit from the knowledge of technical staff involved in the establishment of the project.

Technical advice for local farmers and municipalities	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Local (1)	Local (1)
Probability	Definite (4)	Definite (4)
Duration	Short term (1)	Short term (1)
Magnitude	Low (1)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	Low cumulative impact (2) – Positive cumulative impact associated with reduced reliance on coal generated energy and move towards renewable energy.	
<b>Significance</b>	<b>Positive Low (10)</b>	<b>Positive Low (20)</b>
Can impacts be mitigated?	Kappa Solar Power Plant in consultation with the contractor should hold a workshop/s with local farmers and representatives from LTLM to discuss options for installing solar energy facilities and the technology and costs involved.	

	Also refer to table 25 of the EMPr for mitigation measures related to social impacts.
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- Increase in construction vehicle traffic – The movement of heavy construction vehicles during the construction phase has the potential to damage local farm roads and create dust and safety impacts for other road users in the area. As indicated above, the Kappa SPP site is located ~ 2 km north of the N12 and is accessed via a servitude road that also provides access to the railway line, Honesty Substation and Mr Uys farmland. Although this road is not heavily utilized, the movement of heavy construction vehicles will damage the road surface and impact on other road users. Sections of this access road may also need to be widened to accommodate large construction vehicles. This will need to be discussed with Mr Uys. Care will also need to be taken at the intersection with the N12 to ensure that construction vehicles do not pose a safety threat to other motorists.

Increase in construction vehicle traffic	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	Low (1)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Medium cumulative impact (3). If damage to roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage.	
<b>Significance</b>	<b>Negative low (22)</b>	<b>Negative low (11)</b>
Can impacts be mitigated?	<p>The potential impacts associated with heavy vehicles can be effectively mitigated. The mitigation measures include:</p> <ul style="list-style-type: none"> <li>• The contractor must ensure that damage caused by construction related traffic to the gravel access road off the N 12 is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;</li> <li>• Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;</li> <li>• All vehicles must be road-worthy and drivers must be qualified and made aware of the</li> </ul>	

	<p>potential road safety issues and need for strict speed limits.</p> <p>Also refer to table 25 of the EMPr for mitigation measures related to social impacts.</p>
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- Impact of construction workers on local communities - The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

<b>Impacts of construction workers on local communities</b>	<b>Pre-mitigation impact rating</b>	<b>Post mitigation impact rating</b>
Status (positive or negative)	Negative	Negative
Extent	Local (1)	Local (1)
Probability	Probable (3)	Probable (3)
Duration	Short term for community as a whole (1) Long term-permanent for individuals who may be affected by STDs etc. (3)	Short term for community as a whole (1) Long term-permanent for individuals who may be affected by STDs etc. (3)
Magnitude	Low for the community as a whole (1) High-Very High for specific individuals who may be affected by STDs etc. (4)	Low for the community as a whole (1) High-Very High for specific individuals who may be affected by STDs etc. (4)
Reversibility	Completely reversible (1) but not in case of HIV and AIDS	Completely reversible (1) but not in case of HIV and AIDS
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Medium cumulative effects (3), impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.	
Significance	Low for the community as a whole (13) Medium for specific individuals who may be affected by STDs etc. (52)	Low for the community as a whole (13) Medium for specific individuals who may be affected by STDs

	etc. (52)
Can impacts be mitigated?	<p>Yes, the potential risks associated with construction workers can be effectively mitigated. The detailed mitigation measures are outlined in the Environmental Management Programme (EMPr) for the Construction Phase. Aspects that should be covered include:</p> <ul style="list-style-type: none"> <li>• Where possible Kappa Solar Power Plant should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;</li> <li>• Kappa Solar Power Plant should consider the need for establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the LTLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers;</li> <li>• Kappa Solar Power Plant and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;</li> <li>• Kappa Solar Power Plant and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;</li> <li>• The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area;</li> <li>• The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;</li> <li>• Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;</li> </ul>

	<ul style="list-style-type: none"> <li>It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site. Also refer to table 25 of the EMPr for mitigation measures related to social impacts.</li> </ul>
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- Influx of job seekers - Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become “economically stranded” in the area or decide to stay on irrespective of finding a job or not. While the proposed Kappa facility on its own does not constitute a large construction project other facilities are also proposed near Christiana. When considered together these facility projects may attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can impact on the local community.

Influx of job seekers	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	Low (1)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Medium cumulative effects (3), Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.	
<b>Significance</b>	<b>Negative low (22)</b>	<b>Negative low (11)</b>
Can impacts be mitigated?	<p>It is not possible to prevent job seekers from coming to the area in search of a job. The potential influx of job seekers to the area as a result of the proposed Kappa Solar Power Plant facility and other projects is likely to be low. The following mitigation measures are proposed:</p> <ul style="list-style-type: none"> <li>Kappa Solar Power Plant should implement a “locals first” policy, specifically with regard to unskilled and low skilled opportunities;</li> <li>Kappa Solar Power Plant should implement a policy that no employment will be available at the gate.</li> </ul>	

	Also refer to table 25 of the EMPr for mitigation measures related to social impacts.
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- Risk to safety, livestock and farm infrastructure - The presence on and movement of construction workers on and off the site poses a potential safety threat to local farmer's and farm workers in the vicinity of the site threat. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged or stock theft linked either directly or indirectly to the presence of farm workers on the site. The local farmers in the area interviewed, specifically Mr. Josef Uys, indicated that the presence of construction workers on the site increased the exposure of their farming operations and livestock to the outside world, which, in turn, increased the potential risk of stock theft and crime. Mr Uys also raised concerns regarding access to the site via the servitude road as he owns the property on either side of the access road. His property would therefore stand to be the most exposed to potential risks associated with the movement of construction workers to and from the site. The local farmers did, however, indicate that the potential risks (safety, livestock and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on the site workers during the construction phase.

Risk to safety, livestock and farm infrastructure	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Short term (1)	Short term (1)
Magnitude	Medium (2)	Low (1)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Negligible cumulative effects (1), provided losses are compensated for.	
<b>Significance</b>	<b>Negative low (22)</b>	<b>Negative low (11)</b>
Can impacts be mitigated?	<p>Key mitigation measures include:</p> <ul style="list-style-type: none"> <li>• Kappa Solar Power Plant should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;</li> <li>• The construction area should be fenced off prior to the commencement of the construction phase. The movement of construction workers on the site should be confined to the fenced off area;</li> <li>• Contractors appointed by Kappa Solar Power Plant should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;</li> <li>• Kappa Solar Power Plant should consider the</li> </ul>	

	<p>option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;</p> <ul style="list-style-type: none"> <li>• Kappa Solar Power Plant should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities (see below);</li> <li>• The Environmental Management Programme (EMPr) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;</li> <li>• Contractors appointed by Kappa Solar Power Plant must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.</li> <li>• Contractors appointed by Kappa Solar Power Plant must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;</li> <li>• The housing of construction workers on the site should be strictly limited to security personnel.</li> </ul> <p>Also refer to table 25 of the EMPr for mitigation measures related to social impacts.</p>
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- Increased risk of veld fires - The presence of construction workers and construction-related activities on the site poses an increased risk of veld fires that could in turn pose a threat to livestock, crops, wildlife and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened. The local farmers interviewed (Mr UYs and Mr van der Merwe and the land owner, Mr van Aswegen), all indicated that grass fires were common in the area and posed a significant threat to their livestock operations. They also indicated that the potential risk of grass fires was heightened by the windy conditions in the area, specifically during the dry, windy winter months from July to

October. In terms of potential mitigation measures, fire-breaks should be constructed around the perimeter of the site prior to the commencement of the construction phase. In addition, a fire fighting vehicle should be present at all times on the site during the construction phase.

Increased risk of veld fires	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Region (3)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Medium term (2)	Short term (1)
Magnitude	High (3)	Low (1)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Negligible cumulative effects (1), provided losses are compensated for.	
<b>Significance</b>	<b>Negative medium (33)</b>	<b>Negative low (9)</b>
Can impacts be mitigated?	<p>The mitigation measures include:</p> <ul style="list-style-type: none"> <li>• Kappa Solar Power Plant should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;</li> <li>• A fire-break should be constructed around the perimeter of the site prior to the commencement of the construction phase;</li> <li>• Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;</li> <li>• Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;</li> <li>• Contractor to provide adequate fire fighting equipment on-site;</li> <li>• Contractor to provide fire-fighting training to selected construction staff;</li> <li>• No construction staff, with the exception of security staff, to be accommodated on site over night;</li> <li>• As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the</li> </ul>	



	<p>appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.</p> <p>Also refer to table 5 of the EMPr for mitigation measures related to fire risks.</p>
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### 5.12.2 Impacts that may result from the operational phase

**Direct impacts:** During the operational phase the study area will serve as an electricity generation facility and the impacts are generally associated with soil erosion, change in land use, the change of land use, increase in storm water runoff, increased consumption of water, visual intrusion, the generation of general waste, leakage of hazardous materials, and the change in the sense of place. The operational phase will also have a direct positive impact through the provision of permanent employment opportunities, the generation of additional electricity, the establishment of a community trust, financial implication to tourism in the area, and the development of infrastructure for the generation of clean, renewable energy. The abovementioned impacts are discussed in more detail below:

- **Soil erosion** –The largest risk factor for soil erosion will be during the operational phase when storm water run-off from the surfaces of the photovoltaic panels will cause erosion. Erosion will be localised within the site boundary but will have a permanent effect that would stretch into the operational phase of the project. This will ultimately lead to the irretrievable commitment of this resource. The measurable effect of reducing erosion by utilizing mitigation measures may reduce possible erosion significantly (refer to Appendix D5 for the Agricultural and Soils Impact Assessment).

Soil erosion	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local/Regional (2)	Local/Regional (2)
Probability	Definite (4)	Unlikely (1)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	Medium cumulative impact (3). Should these impacts occur, there will be a cumulative impact on the air and water resources in the study area in terms of pollution.	
Significance	<b>Negative High (51)</b>	<b>Negative low (26)</b>
Can impacts be mitigated?	Yes, to avoid soil erosion it will be a good practice to design storm water canals into which the water from the panels can be channeled. These canals should reduce the speed of the water and allow the water to drain slowly onto the land. Another important measure is to avoid stripping land surfaces of existing vegetation by	

	<p>only allowing vehicles to travel on existing roads and not create new roads.</p> <p>The Agricultural and Soils Impact Assessment (refer to Appendix D5) provide the following mitigation or management measures: Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.</p> <p>Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records the occurrence of any erosion on site or downstream.</p> <p>Also refer to tables 29 and 31 of the EMPr – Appendix F.</p>
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- Change in land-use – The use of the area for the construction and operation of the PV plant will result in the area not being used for livestock grazing anymore. However, the site and surrounds is non-arable, moderate potential grazing land and has a grazing capacity of 11-15 hectares per large stock unit (refer to Appendix D5 for the Agricultural and Soils Impact Assessment). The impact on farm income due to the loss of grazing will be more than offset by the income from Kappa Solar. Mr van Aswegen also indicated that he is in a position to relocate cattle on the farm to other farms he owns in the area if needed. The impact of the proposed SPP on the economic potential of the farm will therefore be low. In addition, the final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the operational phase can therefore be mitigated by minimising the footprint of the proposed SPP. The impact on current and future agricultural uses of the land is therefore regarded as low.

Change in land use	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Low (1)	Low (1)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impacts (2). Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.	
Significance	Negative low (13)	Negative low (13)

Can impacts be mitigated?	<p>The proponent should investigate the option of establishing a Rehabilitation Fund to be used to rehabilitate the area once the proposed facility has been decommissioned. The fund should be funded by revenue generated during the operational phase of the project. The motivation for the establishment of a Rehabilitation Fund is based on the experience from the mining sector where many mines on closure have not set aside sufficient funds for closure and decommissioning.</p> <p>Also refer to tables 38 of the EMPr – Appendix F.</p>
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- Generation of alternative land use income – Income generated through the rental of the energy facility will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve the financial sustainability of farming on site (Refer to Appendix D5 for the Agricultural and Soils Impact Assessment).

Generation of alternative land use income	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Geographical extent	Site (1)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resources (1)	No loss of resources (1)
Cumulative impact	Low cumulative impact (2).	
<b>Significance</b>	<b>Positive Low (24)</b>	<b>Positive Low (24)</b>
Can impacts be mitigated?	No mitigation required.	

- Increase in storm water runoff – The development will potentially result in an increase in storm water run-off that needs to be managed to prevent soil erosion, especially where vegetation will be cleared. Storm water canals will be designed into which the water from the panels can be channeled. These canals should reduce the speed of the water and allow the water to drain slowly onto the land. Vegetation corridors should be maintained within the subject area.

Increase in storm water runoff	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Unlikely (1)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Low (1)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)

Cumulative impact	Medium cumulative impact (3) - Should these impacts occur, there will be a cumulative impacts on the wider area.	
Significance	Negative medium (30)	Negative low (13)
Can impacts be mitigated?	Yes. It is therefore important that all management actions and mitigation measures included in the EMPr are implemented to ensure that these impacts do not occur – refer to table 32 of the EMPr.	

- Increased consumption of water - Approximately 3,000,000 liters of water per annum will be required for the operation of the solar plant. Cleaning will take place once every quarter. The water will be sourced from groundwater sources.

Increased consumption of water	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Region (3)	Region (3)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	Marginal loss of resources (2)	Marginal loss of resources (2)
Cumulative impact	High cumulative impacts (4) - An additional demand on water sources could result in a significant cumulative impact with regards to the availability of water.	
Significance	Negative medium (40)	Negative medium (40)
Can impacts be mitigated?	Yes, management actions and mitigation measures related to the use of water are included in the EMPr – refer to table 32.	

- Visual intrusion - The Visual Impact Assessment (Refer to Appendix D4) found that the view shed covers a large area, which indicates a high visibility. Much or all of the PV plant will be visible from areas within and beyond the site, but due to the low population density of the area, there are very few visual receptors that may be significantly affected by the development. The Visual Impact Assessment also confirms that the site will be visible within most of the 1, 2 and 3 km zones, and beyond the 3 km zone the site is visible to a further area to the south east. Since this is sparsely populated agricultural land, there are very few visual receptors, apart from railway travellers, for whom the view is partial and transient, mitigated by a degree of screening by scattered trees and shrubs on the site. Moreover, the usage frequency of the railway for travellers is relatively low; hence the number of receptors is also relatively low. For motorists on the N12, the site is effectively invisible due to the 4 km distance from the site, and a degree of screening by scattered

trees and shrubs on the site. In addition, since the N12 is located at the same or slightly lower height than the site, only the edge of the facility is likely to be visible.

Visual intrusion	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (3)	Low (1)
Reversibility	Recoverable (1)	Recoverable (1)
Irreplaceable loss of resources	No loss of resources (1)	No loss of resources (1)
Cumulative impact	Low cumulative impact (2). The construction of the solar plant and associated infrastructure will increase the cumulative visual impact of industrial type infrastructure in the region. However this is not yet relevant in light of relatively low level occurrence of such infrastructure.	
Significance	<b>Negative medium (45)</b>	<b>Negative low (14)</b>
Can impacts be mitigated?	<p>Yes, mitigation measures are included in the visual impact assessment study and table 36 of the EMPr. The VIA recommends the following mitigation measures:</p> <ul style="list-style-type: none"> <li>• Apart from the substation and support infrastructure, structures must be limited to a height of no more than 3,5 m.</li> <li>• Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer. Security lighting should make use of down-lights to minimise light spill, and motion detectors where possible so that lighting at night is minimised. Care should be taken with the layout of the security lights to prevent motorists from being blinded by lights at the approach to Kappa.</li> <li>• Screening should be implemented by means of vegetation in conjunction with security fencing.</li> </ul> <p>Also refer to table 36 of the EMPr for mitigation measures related to fire risks.</p>	

- Generation of waste - Security guards will be stationed at the solar facility 24 hours a day and 7 days a week. Sources of general waste will be waste food, packaging, paper, etc.

General waste will be stored on the site and removed on a weekly basis. The Local Municipality still has to confirm that the dumping site has the capacity to accommodate the additional waste generated by the employees working at the Solar Power Plant

Generation of waste	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Low (1)	Low (1)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Medium cumulative impact (3) - An additional demand for landfill space could result in significant cumulative impacts with regards to the availability of landfill space.	
<b>Significance</b>	<b>Negative low (15)</b>	<b>Negative low (15)</b>
Can impacts be mitigated?	Yes, management actions related to waste management are included in table 34 of the EMPr.	

- Leakage of hazardous materials - The proposed development will comprise of a distribution substation and will include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies and must be prevented by constructing oil bunds to ensure that any oil spills are suitably attenuated and not released into the environment.

Leakage of hazardous materials	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Possible (2)	Unlikely (1)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	The impact would result in negligible to no cumulative effects (1)	
<b>Significance</b>	<b>Negative medium (36)</b>	<b>Negative low (22)</b>
Can impacts be mitigated?	Yes. It is therefore important that all management actions and mitigation measures included in the EMPr (table 32) are implemented to ensure that these impacts do not occur.	

- Permanent employment - Based on information from estimated global employment ratios per MW of solar PV installed (viz. 0.7 direct long term opportunities/ MW), the proposed development would create ~ 60 employment opportunities for over a 20 year period.

Permanent employment	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	Low cumulative impact (2) – Creation of permanent employment and skills and development opportunities for members of the local community and creation of additional business and economic opportunities in the area.	
<b>Significance</b>	<b>Negative Medium (30)</b>	<b>Negative Medium (30)</b>
Can impacts be mitigated?	<p>The enhancement measures listed for the temporary employment opportunities during the construction phase to enhance local employment and business opportunities, also apply to the operational phase. In addition:</p> <ul style="list-style-type: none"> <li>• Kappa Solar Power Plant should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;</li> <li>• Kappa Solar Power Plant, in consultation with the LTLM, should investigate the options for the establishment of a Community Development Trust.</li> </ul> <p>Also refer to table 37 of the EMPr for mitigation measures related to employment.</p>	

- Generation of additional electricity - The photovoltaic effect of the panels will generate electricity that will either tie in with the Honesty Traction 132kV Substation, which is located approximately 90m from the site or the Bloemheuwel-Ganspan. The transmission line will be constructed within 36m wide servitude and will traverse the Remaining Extent of the farm Honesty 43. The evacuation of generated electricity into the Eskom grid will strengthen and stabilize the grid (especially in the local area).

Generation of additional electricity	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)

Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	Low cumulative impact (2) - The evacuation of generated electricity into the Eskom grid will strengthen and stabilize the grid (especially in the local area).	
<b>Significance</b>	<b>Positive medium (30)</b>	<b>Positive medium (30)</b>
Can impacts be mitigated?	No mitigation measure required.	

- Establishment of a Community Trust - In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. This revenue can be used to fund development initiatives in the area and support the local community. The long term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed plant can be used to support a number of social and economic initiatives in the area.

<b>Establishment of a community trust</b>	<b>Pre-mitigation impact rating</b>	<b>Post mitigation impact rating</b>
Status (positive or negative)	Positive	Positive
Extent	Local (2)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	High (3)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	Medium cumulative impact (3) - Promotion of social and economic development and improvement in the overall well-being of the community.	
<b>Significance</b>	<b>Positive medium (30)</b>	<b>Positive medium (45)</b>
Can impacts be mitigated?	<p>In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:</p> <ul style="list-style-type: none"> <li>• The LTLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the LTLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.</li> <li>• Clear criteria for identifying and funding</li> </ul>	



	<p>community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;</p> <ul style="list-style-type: none"> <li>• Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the plant.</li> </ul> <p>Also refer to table 38 of the EMPr for mitigation measures related to social impacts.</p>
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**Indirect impacts:** The operational phase will have an indirect negative impact through the change in the sense of place and an indirect positive impact through the provision of additional electrical infrastructure.

- Change in the sense of place – The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. The findings of the SIA (refer to Appendix D6) indicate that the proposed site will not be visible from the N12. In addition the visual integrity of the area has been impacted by the electrified railway line and existing Eskom power lines and Honesty substation. The impact of the proposed SPP on the areas sense of place with mitigation is therefore likely to be low.

Change in sense of place	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (1)	Low (1)
Reversibility	Reversible (2)	Reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Low cumulative impact (2). The construction of the solar plant and associated infrastructure will increase the cumulative change in the sense of place due to industrial type infrastructure in the region. However this is not yet relevant in light of relatively low level occurrence of such infrastructure.	
<b>Significance</b>	<b>Negative low (14)</b>	<b>Negative low (14)</b>
Can impacts be mitigated?	Yes, mitigation measures relating to visual impacts are included in the EMPr. The recommendations contained in the VIA should be implemented – refer to previous discussions on visual impacts..	

- Potential impact on tourism – The tourism sector is regarded as an important economic sector in the NWP and LTLM. The tourism potential of the area is linked to the areas natural resources, including the relatively undisturbed scenery and landscape. As indicated above, the findings of the SIA indicate that the impact of the proposed SPP on the areas sense of place with mitigation is likely to be low. In addition, the site will not be visible from or impact on the Treasure Corridor associated with the N12. The impact of the proposed SPP on the tourism potential of the area and the LTLM and NWP is therefore likely to be low. In some instances the SPP may attract tourists to the area. However, the significance of this potential benefit is also rated as low positive.

Potential impacts on tourism	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Extent	Local (2)	Local (2)
Probability	Probable (3)	Probable (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (24) (Applies to both – and +)	Low (24) (Applies to both – and +)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	N/a	N/a
Cumulative impact	The proposed SPP is one of two SPPs proposed located in the vicinity of Klerksdorp and Orkney in the LTLM. Due to size and height of SPPs the potential cumulative impact on the tourism potential of the area are not rated significant.	
<b>Significance</b>	<b>Negative low (11)</b>	<b>Negative low (11)</b>
Can impacts be mitigated?	The recommendations contained in the VIA should be implemented – refer to previous discussions on visual impacts.	

- Development of infrastructure for the generation of clean, renewable energy - South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. Much of the coal used has high sulphur content. As a result South Africa is the nineteenth largest per capita producer of carbon emissions in the world, and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The overall contribution to South Africa's total energy requirements of the proposed facility is relatively small. However, the 84 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

Development of infrastructure for the generation of clean, renewable energy	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Probability	Definite (4)	Definite (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Reversibility	reversible (4)	reversible (4)
Irreplaceable loss of resources	Yes, impact of climate change on ecosystems	
Cumulative impact	Medium cumulative impact (3) Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.	
<b>Significance</b>	<b>Positive low (18)</b>	<b>Positive low (18)</b>
Can impacts be mitigated?	<p>The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project Kappa Solar Power Plant should:</p> <ul style="list-style-type: none"> <li>• Use the project to promote and increase the contribution of renewable energy to the national energy supply;</li> <li>• Maximise the public's exposure to the project via an extensive communication and advertising programme;</li> <li>• Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.</li> </ul> <p>Also refer to table 38 of the EMPr for mitigation or enhancement measures related to social impacts.</p>	

### 5.12.3 Impacts that may result from the decommissioning and closure phase

**Direct impacts:** Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20 - 25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning. If infrastructures are removed after a 20/25 year period, the site

will be returned to its natural state. Therefore the physical environment will benefit from the closure of the solar facility.

- Rehabilitation of the physical environment – The physical environment will benefit from the closure of the solar facility since the site will be restored to its natural state.

Rehabilitation of the physical environment	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Site (1)	Site (1)
Probability	Possible (2)	Probable (3)
Duration	Long term (3)	Long term (3)
Magnitude	Low (1)	Medium (2)
Reversibility	N/A	N/A
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	The impact would result in negligible to no cumulative effects (1)	
<b>Significance</b>	<b>Negative low (7)</b>	<b>Negative low (16)</b>
Can impacts be mitigated?	No mitigation measures required.	

- Generation of waste - The panels contain material that may be hazardous in nature if released into the environment. If the panels are intact, there will be no risk of exposure. The removal of the supporting infrastructure such as the concrete foundations, cabling, fencing and control rooms, etc. will generate waste. Some of the waste will where possible be recycled, for example steel support structures can be re-used elsewhere or melted down to form new products. The amount of waste will be limited and is not expected to significantly reduce the capacity of the local landfill. However, the project is estimated to last for 20-25 years and the current licensed landfill sites near Christiana (such as Hoopstad, Boshof, Vryburg, Wolmaranstad, Wesselsbron, Warrenton, Kimberley or Welkom), may at that stage (or sooner) reach its capacity. The applicant will need to assess the project lifespan and make suitable arrangements for waste disposal when the site is decommissioned.

Generation of waste	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Short term (1)	Short term (1)
Magnitude	High (3)	Medium (2)
Reversibility	Irreversible (4)	Partly reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Medium cumulative impact (3) - An additional demand on municipal services could result in significant cumulative impacts with regards to the availability of landfill space.	
<b>Significance</b>	<b>Negative medium (45)</b>	<b>Negative low (26)</b>
Can impacts be mitigated?	Yes – refer to table 41 of the EMPr, Appendix F.	

- Loss of employment - Given the relatively large number of people employed during the operational phase, the decommissioning of the facility has the potential to have a negative social impact on the local community. However, the potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme.

Loss of employment	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Possible (2)	Possible (2)
Duration	Medium term (2)	Short term (1)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	The impact would result in negligible to no cumulative effects (1)	
<b>Significance</b>	<b>Negative medium (30)</b>	<b>Negative low (18)</b>
Can impacts be mitigated?	<p>The following mitigation measures are recommended:</p> <ul style="list-style-type: none"> <li>• Kappa Solar Power Plant should ensure that retrenchment packages are provided for all staff retrenched when the facility is decommissioned.</li> <li>• All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning;</li> <li>• Kappa Solar Power Plant should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.</li> </ul> <p>Also refer to table 48 of the EMPr for mitigation measures related to employment.</p>	

**Indirect impacts:** No indirect impacts are anticipated from the decommissioning phase of the proposed development.

## 6. ENVIRONMENTAL IMPACT STATEMENT

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This section aims to address the following requirements of the regulations:

- 31(2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include –
- (m) an opinion as to whether the 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;
  - (n) an environmental impact statement which contains –
    - (i) a summary of the key findings of the environmental impact assessment; and
    - (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives

### 6.1 Summary of key findings and assessment results

Based on the contents of the report the following key environmental issues were identified, which were addressed in this EIA report:

- Impacts during the construction phase.
  - Generation of waste (- Low)
  - Impacts on heritage objects (- Low)
  - Temporary employment opportunities (+ Medium)
  - Visual intrusion (- Low)
  - Impact of construction workers on local communities (- Medium for specific individuals who may be affected by STDs etc.)
  - Increased risk of veld fires (- Low)
- Impacts during the operational phase, which include:
  - Soil erosion (- Low)
  - Increase in storm water runoff (- Low)
  - Increase in consumption of water (- Medium)
  - Visual intrusion (- Low)
  - Leakage of hazardous materials (- Low)
  - Permanent employment opportunities (+ Medium)
  - Generation of additional electricity (+ Medium)
  - The establishment of a community trust (+ Medium)
- During the decommissioning phase -
  - Generation of waste (- Low)
  - Loss of employment (- Medium)

## 6.2 Recommendation of EAP

The final recommendation by the EAP considered firstly if the legal requirements for the EIA process had been met and secondly the validity and reliability of the substance of the information contained in the EIA report. In terms of the legal requirements it is concluded that:

- The scoping phase complied with the agreement and specification set out in the Regulations 28 to 29 – already approved by the environmental authority.
- All key consultees have been consulted as required by the Regulations 28 and 54 to 57 - already approved by the environmental authority.
- The EIA process has been conducted as required by the Regulations 31 and 33.
- The proposed mitigation measures will be sufficient to mitigate the identified impacts to an acceptable level.
- No additional specialist studies are proposed on any environmental issue raised and thus, no terms of reference are provided for such studies.

In terms of the contents and substance of the EIA report the EAP is confident that:

- All key environmental issues were identified during the scoping phase.
- These key issues were adequately assessed during the EIA phase to provide the environmental authority with sufficient information to allow them to make an informed decision.

### **The final recommendation of the EAP is that:**

It is the opinion of the independent EAP that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources. All negative environmental impacts can further be effectively mitigated through the proposed mitigation measures. Based on the contents of the report it is proposed that an environmental authorisation be issued, which states (amongst other general conditions) that the Kappa photovoltaic solar facility and associated infrastructure, Registration Division IN, North West be approved subject to the following conditions:

- Implementation of the proposed mitigation measures set out in the EMPr.
- Implementation of the proposed mitigation measures set out in the specialist studies.
- The proposed solar facility must comply with all relevant national environmental laws and regulations.

We trust that the department find the report in order and eagerly await your final decision in this regard.

**Carli Steenkamp**

Environamics - Environmental Consultants

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