FINAL ENVIRONMENTAL IMPACT REPORT

7 October 2016

THE PROPOSED BOITSHOKO SOLAR POWER PLANT NEAR KATHU, NORTHERN CAPE PROVINCE

ENVIRONAMICS

PROJECT DETAIL

DEA Reference No.	**:**	14/12/16/3/3/2/935
Project Title	**:**	Proposed Boitshoko Solar Power Plant near Kathu, Northern Cape Province
Authors	**:**	Mrs. Carli Otte Ms. Marélie Griesel Ms. Liesl De Swardt
Client	**:**	Boitshoko Solar Power Plant (RF) (Pty) Ltd.
Report Status	**:**	Final Environmental Impact Report
Submission date	**:**	7 October 2016

When used as a reference this report should be cited as: Environamics (2016) Final EIR: Proposed Boitshoko Solar Power Plant near Kathu, Northern Cape Province.

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GLOSSARY OF TERMS AND ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
CEA	Cumulative Effects Assessment
DEA	Department of Environmental Affairs
DM	District Municipality
DoE	Department of Energy
DWS	Department of Water and Sanitation
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
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
PPP	Public Participation Process
PV	Photovoltaic
REIPPP	Renewable Energy IPP Procurement Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
VU	Vegetation Unit

CONTEXT FOR THE DEVELOPMENT

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 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 Update 2010-2030). In terms of the Integrated Resource Plan Update (IRP Update, 2010-2030), over the short term (of the next two or three years), clear guidelines arose; namely to continue with the current renewable bid programme with additional annual rounds of 1000 MW PV, with approximately 8.4GW of the renewable energy capacity planned to be installed 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, Boitshoko Solar Power Plant (RF) (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 on the Remaining Extent of Portion 1 of the farm Limebank No. 471, registration division Kuruman, Northern Cape 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 around 2200 kWh/m²/annum.

EXECUTIVE SUMMARY

Like many other small and developing municipalities in the country, the Gamagara Local Municipality faces a number of challenges in addressing the needs and improving the lives of the community (IDP, 2015-2017). The Integrated Development Plan (2012-2017) of the John Taolo Gaetsewe District Municipality sets out the following objectives for the integrated development of the Gamagara Local Municipality's (JMLM): (1) to render quality, effective and sufficient services; (2) to promote the general wellbeing through a safe and healthy environment amongst all residents; (3) to promote equality and fairness in the allocation of resources; and (4) to promote sound and sustainable economic growth in the municipal area.

In response to the above Boitshoko Solar Power Plant (RF) (Pty) Ltd. intends to develop a 115MW photovoltaic solar facility and associated infrastructure on the Remaining Extent of Portion 1 of the farm Limebank No. 471, Registration Division Kuruman, Northern Cape Province situated within the Gamagara Local Municipality area of jurisdiction. The town of Kathu is located approximately 18km south 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 280 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, ecological sensitivity and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation), as well as site access via a main road (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase).

The Environmental Impact Assessment (EIA) Regulations, 2014 (Regulation 982) 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 11(i) (GN.R. 983): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*

- Activity 28(ii) (GN.R. 983): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*

- Activity 1 (GN.R. 984): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more..."*

- Activity 15 (GN.R. 984): *"The clearance of an area of 20 hectare or more of indigenous vegetation..."*

Being listed under Listing Notice 1 and 2 (Regulation 983 & 984) 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 21-24. Environamics has been appointed as the independent consultant to undertake the EIA on Boitshoko Solar Power Plant's behalf.

Appendix 3 to GNR982 requires that the EIA process be undertaken in line with the approved plan of study for EIA and that the environmental impacts, mitigation as well as the residual risks of the proposed activity be set out in the environmental impact assessment report (EIR). The potential positive and negative impacts associated with the proposed development have been assessed and the potentially most significant environmental impacts associated with the development are briefly summarised 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 impacts on the fauna and flora, soils, geology, existing services infrastructure, Impacts on surface water, socio-economic impacts such as the provision of temporary employment and other economic benefits, and the impacts on health and safety and heritage resources.

Impacts during the operational phase:

During the operational phase the study area will serve as a solar plant. The potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with impacts on the fauna and flora, soils, geology, the pressure on existing services infrastructure, and visual impacts. 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.

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 however potentially result in impact on soils, surface water, heritage sources and the loss of permanent employment. Skilled staff will be eminently employable and a number of temporary jobs will also be created in the process. Decommissioning of a PV facility will leave a positive impact on the habitat and biodiversity in the area as the area will be rehabilitated to its natural state.

Cumulative impacts:

Cumulative impacts could arise as other similar projects are constructed in the area. According to the Energy Blog's database three other solar PV plants has been granted preferred bidder status within a 30km radius of the proposed Boitshoko PV plant.

However, according to the Department's database five (4) other solar plants have been proposed in relative close proximity to the proposed activity.

The potential for cumulative impacts may therefore exist. The Final EIR includes a detailed assessment of the potential cumulative impacts associated with the proposed development. Potential cumulative impacts with a significance rating of negative medium during the construction phase relate to: loss or fragmentation of indigenous natural fauna and flora, loss or fragmentation of habitats, generation of waste, temporary employment opportunities, impact of construction workers on local communities, and an influx of job seekers and traffic impacts. Cumulative impacts (-Medium) during the operational phase relate to: visual intrusion, soil erosion, generation of additional electricity, the establishment of a community trust and the development of infrastructure for the generation of clean, renewable energy. The cumulative effect of the generation of waste was identified as being potentially significant during the decommissioning phase.

Regulation 23 of the EIA Regulations determine that an EIA report be prepared and submitted for the proposed activity after the competent authority approves the final scoping report. The EIA report will evaluate and rate each identified impact, and identify mitigation measures that may be required. The EIA report contains information that is necessary for the competent authority to consider the application and to reach a decision contemplated in Regulation 24 of the EIA Regulations.

1 INTRODUCTION

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

Appendix 3. (3) A environmental impact assessment report contains the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-(a) details of:

(i) the EAP who prepared the report; and

(ii) the expertise of the EAP, including a curriculum vitae.

1.1 LEGAL MANDATE AND PURPOSE OF THE REPORT

Regulations No. 982, 983, 984 and 985 (of 4 December 2014) promulgated in terms of Section 24(5) and 44 of the National Environmental Management Act, (107 of 1998) determine that an EIA process should be followed for certain listed activities, which might have a detrimental impact on the environment. According to Regulation No. 982 the purpose of the Regulations is: *"…to regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto*".

The EIA Regulations No. 983 and 984 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

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 983, 4 December 2014	Activity 11(i)	• *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* • Activity 11(i) is triggered since the proposed photovoltaic solar facility will transmit and distribute electricity of 132 kilovolts outside an urban area.
GNR. 983, 4 December 2014	Activity 28(ii)	• *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*

		• Activity 28(ii) is triggered since portions of the farm has been previously cultivated and the property will be rezoned to "special" land use.
GNR. 984, 4 December 2014	Activity 1	• *"The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."* • Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 115 MW electricity.
GNR. 984, 4 December 2014	Activity 15	• *"The clearance of an area of 20 hectares or more of indigenous vegetation."* • In terms of vegetation type the site falls within the Kathu Bushveld vegetation types, which is described by Mucina and Rutherford (2006) as 'least threatened'. Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed.

Being listed under Listing Notices 1 and 2 (Regulation 983 & 984) 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 21-24. According to Appendix 3 of Regulation 982 the objective of the EIR is to, through a consultative process:

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

- can be avoided, managed or mitigated;

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

This report is the Final Environmental Impact Report (EIR) to be submitted to the Department of Environmental Affairs. According to Regulation 982 all registered I&APs and relevant State Departments must be allowed the opportunity to review the reports. The draft EIR was made available to registered I&APs and all relevant State Departments. They were requested to provide written comments on the draft EIR within 30 days of receiving it. All issues identified during this review period are 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:

Contact person:	Marélie Griesel		
Postal Address:	PO Box 6484, Baillie Park, 2526		
Telephone:	018-290 8228 (w)	086 762 8336 (f)	081 477 9545 (Cell)
Electronic Mail:	marelie@environamics.co.za		

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the EIA. In terms of the independent status of the EAP a declaration is attached as Appendix A to this report. The expertise of the EAP responsible for conducting the EIA is also summarized in the curriculum vitae included as part of Appendix A.

1.3 DETAILS OF SPECIALISTS

Table 1.2 provides information on the specialists that have been appointed as part of the EIA process. Regulation 13(1)(a) and (b) determines that an independent and suitably qualified, experienced and independent specialist should conduct the specialist study, in the event where the specialist is not independent, a specialist should be appointed to externally review the work of the specialist as contemplated in sub regulation (2), must comply with sub regulation 1. In terms of the independent status of the specialists, their declarations are attached as Appendix H to this report. The expertise of the specialists is also summarized in their respective curriculum vitaes.

Table 1.2: Details of specialists

Study	Prepared by	Contact Person	Postal Address	Tel	e-mail
Geotechnical Study	Johann Lanz Soil Scientist	Johann Lanz	P. O. Box 6209 Uniedal Stellenbosch, 7612	Tel. 021 866 1518 Cell 082 927 9018	johann@johannlanz.co.za
Avifaunal Study	Birds & Bats Unlimited	Dr. Rob Simmons	Constantia Cape Town 8010	Tel: 021 794 8671 Cell: 082 780 0133	rob.simmons@uct.ac.za
Ecological Fauna and Flora Habitat Survey and Wetland Assessment	Environmental Research Consulting	A. Götze	P. O. Box 20640 Noordbrug 2522	Cell: 082 789 4669	albie.erc@gmail.com
Heritage Impact Assessment	J van Schalkwyk Heritage Consultant	J van Schalkwyk	62 Coetzer Avenue Monument Park 0181	Cell: 076 790 6777	jvschalkwyk@mweb.co.za
Paleontological Study	Paleo Field Services	Dr. Lloyd Rossouw	P. O. Box 38806 Langenhovenpark 9330	Cell: 084 250 5992	lloyd.rossouw@gmail.com
Agricultural & Soils Impact Assessment	Johann Lanz Soil Scientist	Johann Lanz	P. O. Box 6209 Uniedal Stellenbosch 7612	Tel: 021 866 1518 Cell: 082 927 9018	johann@johannlanz.co.za
Visual Impact Assessment	Phala Environmental Consultants	Johan Botha	7a Burger Street Potchefstroom 2531	Tel: 082 316 7749	johan@phala-environmental.co.za
Social Impact Assessment	Leandri Kruger Research & SIA Consultant	Mrs. L. Kruger	27 Tuscan Views 51 Ditedu Ave Potchefstroom 2520	Cell: 082 447 1455	leandrihildebrandt@gmail.com
Traffic Assessment Study	BVi Consulting Engineers	Dirk van der Merwe	Edison Square, Century City, 7441	-	dirkvdm@bviwc.co.za

1.4 STATUS OF THE EIA PROCESS

The EIA process is conducted strictly in accordance with the stipulations set out in Regulations 21-24 of Regulation No. 982. Table 1.3 provides a summary of the EIA process and future steps to be taken. It can be confirmed that to date:

- A site visit was conducted with the developer on 28 February 2016 to discuss the proposed development and assess the site.
- The public participation process was initiated on 17 March 2016 and all I&APs were requested to submit their comments by 20 April 2016.
- A fully completed application form and Draft Scoping report was submitted to the Department on 20 May 2016.
- The Draft Scoping Report was made available to all registered I&APs and relevant State Departments on 19 May 2016 and they were requested to provide their comments on the report within 30 days of the notification (19 June 2016).
- A Public Meeting was held on 23 June 2016–and all registered I&APs were invited to attend through emails and a newspaper advertisement on 16 June 2016.
- The Final Scoping Report (FSR) was submitted to the Department of environmental Affairs on 28 June 2016.
- The Department of Environmental Affairs accepted the final scoping report in a letter dated 3 August 2016.
- The Draft EIR Report was submitted to the Department of Environmental Affairs on 2 September 2016.

It is envisaged that the EIA process should be completed within approximately five months of submitting the Final EIR, i.e. by February 2017 – see Table 1.3.

Table 1.3: Project schedule

Activity	**Prescribed timeframe**	**Timeframe**
Site visit		29 Feb. – 2 March 2016
Appoint Avifaunal Specialist	6 Months	Feb. – Aug. 2016
Public participation (BID)	30 Days	17 Mar. – 20 April 2016
Conduct specialist studies	-	Feb. – April 2016

Submit application form and DSR	-	20 May 2016
Public participation (DSR)	30 Days	20 May – 21 June 2016
Submit FSR	-	July 2016
Department acknowledges receipt	10 Days	July 2016
Department approves/reject	43 Days	3 August 2016
Public participation (DEIR)	30 Days	Sept. 2016
Submission of FEIR & EMPr	-	7 October 2016
Department acknowledges receipt	10 Days	October 2016
Decision	107 Days	Oct.-Feb. 2017
Department notifies of decision	5 Days	Feb./March 2017
Registered I&APs notified of decision	14 Days	March 2017
Appeal	20 Days	March 2017

1.5 STRUCTURE OF THE REPORT

This report is structured in accordance with the prescribed contents stipulated in Appendix 3 of Regulation No.982. It consists of seven sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1.4.

Table 1.4: Structure of the report

Requirements for the contents of an EIR as specified in the Regulations		Section in report	Pages
Appendix 3. (3) - An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-			
(a)	details of -	1	14-23
	(i) the EAP who prepared the report; and		
	ii) the expertise of the EAP, including a curriculum vitae.		
(b)	the location of the activity, including-	2	24-34
	(i) the 21-digit Surveyor General code of each cadastral land parcel;		
	(ii) where available, the physical address and farm name;		

	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;		
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-		
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or		
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;		
(d)	a description of the scope of the proposed activity, including-		
	(i) all listed and specified activities triggered and being applied for; and		
	(ii) a description of the associated structures and infrastructure related to the development.		
(e)	a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.	3	35-49
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	4	50-53
(g)	A motivation for the preferred development footprint within the approved site.		
(h)	a full description of the process followed to reach the proposed development footprint within the approved site, including –		
	(i) details of all the development footprint alternatives considered;		
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;		
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	5	54-85
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;		
	(ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and		
	(x) a concluding statement indicating the preferred alternative development location within the approved site.		
	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be	6	86-118

	avoided, managed or mitigated;		
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;		
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;		
	(viii) the possible mitigation measures that could be applied and level of residual risk;		
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-		
	(i) a description of all environmental issues and risks that were identified during the EIA process; and		
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.		
(j)	an assessment of each identified potentially significant impact and risk, including-		
	(i) cumulative impacts;		
	(ii) the nature, significance and consequences of the impact and risk;		
	(iii) the extent and duration of the impact and risk;		
	(iv) the probability of the impact and risk occurring;		
	(v) the degree to which the impact and risk can be reversed;		
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and		
	(vii) the degree to which the impact and risk can be mitigated;		
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;		
(l)	an environmental impact statement which contains-	8	135-137
	(i) a summary of the key findings of the environmental impact assessment:		
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and		
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;		

(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;		
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Not applicable	
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Not applicable	
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	8	135-137
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;		
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Not applicable	
(s)	an undertaking under oath or affirmation by the EAP in relation to-	Appendix A to the report	
	(i) the correctness of the information provided in the report;		
	(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties (I&APs);		
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and		
	(iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs;		
(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not applicable	
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including-	Not applicable	
	(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and		
	(ii) a motivation for the deviation;		
(v)	any specific information that may be required by the CA; and	Not applicable	
(w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not applicable	

2 ACTIVITY DESCRIPTION

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

Appendix 3. (3) An EIR (...) must include-

(b) the location of the activity, including-

(i) the 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name;

(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-

(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;

(d) a description of the scope of the proposed activity, including-

(i) all listed and specified activities triggered and being applied for;

(ii) a description of the associated structures and infrastructure related to the development.

2.1 THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION

The activity entails the development of a photovoltaic solar facility and associated infrastructure on the Remaining Extent of Portion 1 of the farm Limebank No. 471, Registration Division Kuruman, Northern Cape Province situated within the Gamagara Local Municipality area of jurisdiction. The proposed development is located in the Northern Cape Province in the north western interior of South-Africa (refer to figure 2 for the regional map). The town of Kathu is located approximately 18km south east of the proposed development (refer to figure 1 for the locality map).

The project entails the generation of up to 115MW electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 280 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 Boitshoko Solar Power Plant (RF) (Pty) Ltd. from the property owner, Mr. Hendrik van Der Merwe, for the life span of the project (minimum of 20 years). It is expected that generation from the facility will tie in with the Ferrum

– Umtu 132kV power line. The proposed 160m connection line which will traverse the Remaining Extent of Portion 1 of the farm Limebank No. 471 and the Remaining Extent of the farm Wincanton No. 472. The property owner of the Remaining Extent of the farm Wincanton No. 472 is San Solar Energy Facility (Pty) Ltd.

Table 2.1: General site information

Description of affected farm portion	The Remaining Extent of Portion 1 of the farm Limebank No. 471, Registration Division Kuruman, Northern Cape
Description of affected farm portion (powerline)	The Remaining Extent of the farm Wincanton No. 472, Registration Division Kuruman, Northern Cape
21 Digit Surveyor General codes	C04100000000047100001 C04100000000047200000
Title Deed	T2827/1999 T624/2015
Photographs of the site	Refer to the Plates
Type of technology	Photovoltaic solar facility
Structure Height	Panels ~3.5m, buildings ~ 4m and power lines ~32m
Surface area to be covered	Approximately 280 ha
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	280 ha
Generation capacity	115MW
Expected production	Up to 300 GWh per annum

The site is located in a rural area and is bordered by farms. The site survey revealed that the site currently consists of grazing for cattle – refer to plates 1-24 for photographs of the development area. The property on which the development is to be established is owned by Mr. Hendrik van Der Merwe.

2.2 ACTIVITY DESRIPTION

The proposed development will trigger the following activities:

Table 2.2: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 983, 4 December 2014	Activity 11(i)	• *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* • Activity 11(i) is triggered since the proposed photovoltaic solar facility will transmit and distribute electricity of 132 kilovolts outside an urban area.
GNR. 983, 4 December 2014	Activity 28(ii)	• *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* • Activity 28(ii) is triggered since the farm has been previously cultivated and the property will be rezoned to "special".
GNR. 984, 4 December 2014	Activity 1	• *"The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."* • Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 115 megawatts electricity.
GNR. 984, 4 December 2014	Activity 15	• *"The clearance of an area of 20 hectares or more of indigenous vegetation."* • In terms of vegetation type the preferred site falls within the Kathu Bushveld vegetation types, which is described by Mucina and Rutherford (2006) as 'least threatened'. Activity 15 is triggered since portions of the site has not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed.

The potentially most significant impacts will occur during the construction phase of the development, which will include the following activities:

- Site clearing and preparation: Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled.

- Civil works to be conducted:

- Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat.
- 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.
- Construction of access and inside roads/paths – existing paths will be used were reasonably possible. The site is readily accessible from the R380. An internal site road network is to be constructed. Additionally, the turning circle for trucks will also be taken into consideration.
- 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.

2.3 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 up to 115MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple modules will be required to form the solar PV array which will comprise the PV facility. The PV modules will either be tilted at a fixed angle, or mounted on trackers tracking from east to west during the day in order to capture the most solar energy.

- Wiring to Central Inverters - 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.

- 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. As Boitshoko Solar Power Plant (RF) (Pty) Ltd. has not yet received a cost estimate letter from Eskom, it is expected that

generation from the facility will tie in with the Ferrum–Umtu 132kV power line via a 160m connection line. The project will potentially inject up to 100MW into the National Grid. The installed capacity will be up to approximately 115MW.

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4m underground as far as practically possible.

- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site:

  - Office (~16m x 9.85m);
  - Switch gear and relay room (~25m x 14m);
  - Staff lockers and changing room (~21.7m x 9.85m); and
  - Security control (~11.8m x 5.56m)

- Roads – Access will be obtained via the R380 Provincial Road. There is no need for a new access road, because the site will make use of the existing entrance to the site. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access road will have a width of ~6m and the internal road/track between 8m & 10m.

- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Cochrane Clearvu fencing with a height of 2.5 meters will be used.

2.4 LAYOUT DESCRIPTION

The layout plan follows the limitations of the site and aspects such as environmentally sensitive areas, roads, fencing and servitudes on site are considered – refer to figure 9 below. 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). Limited features of environmental significance exist on site apart from wetlands located within close proximity to the site. A final layout plan is included as an Appendix under Layout Plans in the report.

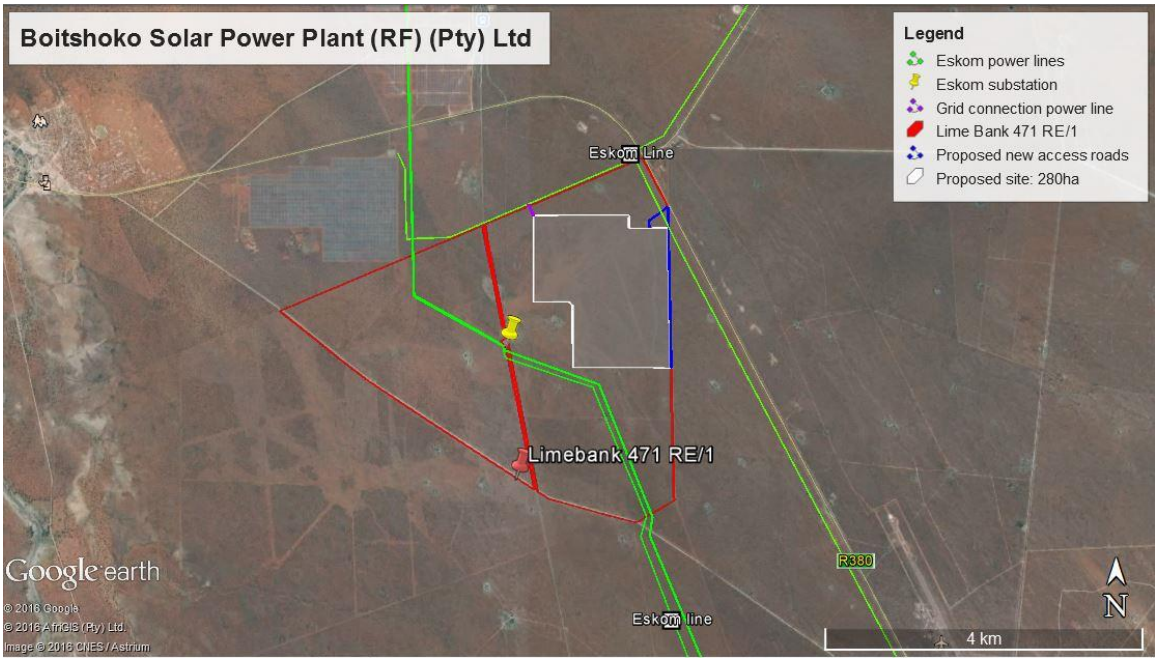


Figure 9: Proposed layout of the Remaining Extent of Portion 1 of the farm Limebank No. 471

Table 2.3 below provides detailed information regarding the layout for the proposed facility as per DEA specifications.

Table 2.3: Technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	3.5 meters
Area of PV Array	280 Hectares
Number of inverters required	Minimum 34
Area occupied by inverter / transformer stations / substations	Inverter Transformer Station: 2.5 x 7.6 meters (19m^2) Substation: 3 000m^2
Capacity of on-site substation	132kV
Area occupied by both permanent and construction laydown areas	Permanent Laydown Area: 280 Hectares Construction Laydown Area: 713.11 m^2
Area occupied by buildings	Security Room: 66.74 m^2 Office: 157.6 m^2 Staff Locker and Changing Room: 213.745 m^2
Length of internal roads	Approximately 13 km
Width of internal roads	Between 8 & 10 meters
Proximity to grid connection	Approximately 780 meters
Height of fencing	Approximately 2.5 meters
Type of fencing	Cochrane Clearvu

Table 2.4 and figure 10 provide and illustrate the corner coordinate points for the proposed development site as well as start, middle and end point coordinates for linear activities.

Table 2.4: Coordinates

Coordinates			
EIA Footprint	1	27°36'13.86"S	22°57'51.26"E
	2	27°36'13.95"S	22°57'33.46"E
	3	27°36'8.78"S	22°57'33.49"E
	4	27°36'8.86"S	22°56'49.10"E
	5	27°36'44.33"S	22°56'49.45"E
	6	27°36'44.28"S	22°57'5.69"E
	7	27°36'45.72"S	22°57'7.22"E
	8	27°37'11.05"S	22°57'7.27"E
	9	27°37'11.26"S	22°57'52.66"E
Access Road	1	27°36'5.06"S	22°57'51.61"E
	2	27°36'11.15"S	22°57'42.62"E
	3	27°36'14.01"S	22°57'42.67"E
Power Line	1	27°36'4.23"S	22°56'46.92"E
	2	27°36'6.72"S	22°56'48.26"E
	3	27°36'9.17"S	22°56'49.60"E

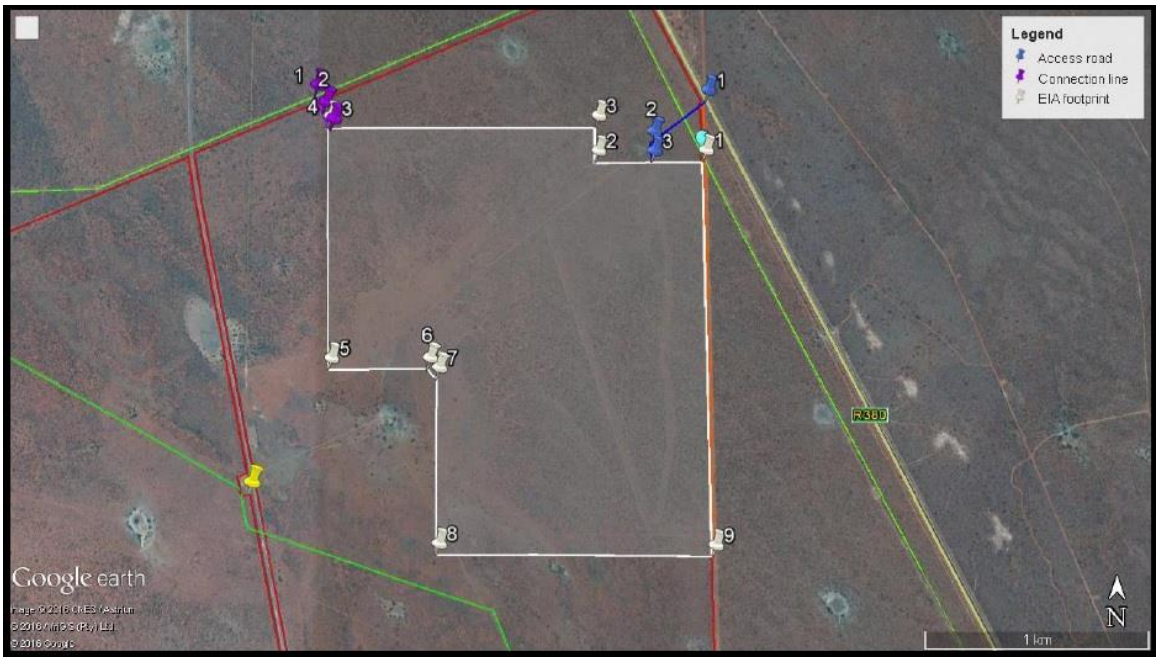


Figure 10: Map indicating coordinate points

2.5 SERVICES PROVISION

The following sections provides information on services required on the site e.g. water, sewage, refuse removal, and electricity.

2.5.1 Water

Adequate provision of water will be a prerequisite for the development. Water for the proposed development will most likely be obtained from ground water resources, or alternatively from the local municipality. The Department of Water Affairs has been asked to confirm the water resource availability in the relevant catchment management area in order to ensure sustainable water supply. 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 site falls within the D41J quaternary drainage region, this drainage region falls under Zone A, which refers to the amount of water that may be taken from the ground water resource per hectare, per annum. According to the Revision of General Authorisations in terms of Section 39 of the National Water Act of 1998 (Act No. 36 of 1998), Zone A indicates no water may be abstracted from a ground water resource without applying for a Water Use License.

The estimated maximum amount of water required during construction is 200m³ per month during the 12 months of construction. The estimated maximum amount of water required during the facility's 20 years of production is 3880m³ 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 460 000 panels will require 920 000 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 3,680,000 liters per annum for washing, and allows 200,000 liters per annum (or 548 liters per day) for toilet use, drinking water, etc. This totals to approximately 3 880m^3 of water required per annum. Drinking water supplied will comply with the SANS:241 quality requirements and it is noted that the Gamagara Local Municipality remains the Water Service Authority in that area of jurisdiction.

Generally, the water supply does not require the construction of a reverse osmosis plant. This is however dependant on the quality of the water, or what the mineral content is. Should a reverse osmosis plant be required, brine (the excess minerals) will be formed during the filtration process that will be stored and then removed. Determining baseline water quality conditions is important in order to appropriately manage incidents in the future. The quality of the water will however only undergo testing if the project is selected as preferred bidder by the Department of Energy. 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.

2.5.2 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 channelled. 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 I.

2.5.3 Sanitation and waste removal

Portable chemical toilets will be utilized, that will be serviced privately or by the local municipality. Waste will be disposed at a licensed Deben landfill site. 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 requested in a letter dated, 18 April 2016 to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (20 years). In a letter dated 25 May 2016 the Gamagara Local Municipality indicated that they do not foresee any problems with the disposal of solid waste from the Boitshoko Solar Power Plant, provided that it excluded building rubble, scrap metal and other refuse which does not fall into the category of domestic waste – refer to Appendix K.

2.5.4 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.

2.6 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.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid.
- The inverters and PV modules would be disconnected and disassembled.
- Concrete foundations (if used) would be removed and the structures would be dismantled.
- The underground cables would be unearthed and removed and buildings would be demolished and removed.
- The fencing would be dismantled and removed.

- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed.
- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules.
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

The rehabilitation of the site would form part of the decommissioning phase. The aim would be to restore the land to its original form (or as close as possible). The rehabilitation activities would include the following:

- Removal of all structures and rubble,
- Breaking up compaction where required, loosening of the soil and the redistribution of topsoil,
- The surface will be restored to the original contours and hydro seeding will take place.

3 LEGISLATIVE AND POLICY CONTEXT

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

Appendix 3. (3) An EIR (...) must include-

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.

3.1 INTRODUCTION

Environmental decision making with regards to solar PV plants is based on numerous policy and legislative documents. These documents inform decisions on project level environmental authorisations issued by the National Department of Environmental Affairs (DEA) as well as comments from local and district authorities. Moreover, it is significant to note that they also inform strategic decision making reflected in IDPs and SDFs. Therefore, to ensure streamlining of environmental authorisations it is imperative for the proposed activity to align with the principles and objectives of key national, provincial and local development policies and legislation. The following acts and policies and their applicability to the proposed development are briefly summarised:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA]
- The National Energy Act, 2008 (Act 34 of 2008)
- National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999)
- Conservation of Agricultural Resources Act, 1983 (Act No. 85 of 1983)
- Strategic Plan, 2015 – 2020 (2015)
- The White Paper on the Energy Policy of the Republic of South Africa (1998)
- The White Paper on Renewable Energy (2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030)
- Northern Cape Provincial Development and Resource Management Plan/ Provincial Spatial Development Framework (PSDF) (2012)

- Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa (2014)
- John Taolo Gaetsewe District Municipality Integrated Development Plan for 2012 – 2016
- Gamagara Local Municipality Draft Integrated Development Plan for 2015 – 2017

The key principles and objectives of each of the legislative and policy documents are briefly summarised in tables 3.1 and 3.2 to provide a reference framework for the implications for the proposed activity.

3.2 LEGISLATIVE CONTEXT

Table 3.1: Legislative context for the construction of photovoltaic solar plants

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The Constitution of South Africa (Act No. 108 of 1996)	National Government	1996	The Constitution is the supreme law of the Republic and all law and conduct must be consistent with the Constitution. The Chapter on the Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment. Section 24 states that "everyone has the right to (a) an environment that is not harmful to their health or well-being and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution therefore, compels government to give effect to the people's environmental right and places government under a legal duty to act as a responsible custodian of the country's environment. It compels government to pass legislation and use other measures to protect the environment, to prevent pollution and ecological degradation, promote conservation and secure sustainable development.
The National Environmental Management Act (Act No. 107 of 1998)	National and Provincial Department of Environmental Affairs	1998	NEMA provides for co-operative governance by establishing principles and procedures for decision-makers on matters affecting the environment. An important function of the Act is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management. Some of the principles in the Act are accountability; affordability; cradle to grave management; equity; integration; open information; polluter pays; subsidiary; waste avoidance and minimisation; co-operative governance; sustainable development; and environmental protection and justice. The mandate for EIA lays with the National Environmental Management Act (107 of 1998) and the EIA Regulations No. 982, 983, 984, and 985 promulgated in terms of Section 24 of NEMA. The EIA Regulations determine that an Environmental Authorisation is required for certain listed activities,

			which might have a detrimental effect on the environment. This EIA was triggered by activity 11(i) and 28(ii) listed in Regulation R983 and activities 1 and 15 listed in Regulation R984 which requires a 'scoping and environmental impact assessment process.'
The National Energy Act (Act No. 34 of 2008)	Department of Minerals and Energy	2008	One of the objectives of the National Energy Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar: "To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble).
The National Water Act (Act No. 36 of 1998)	Department of Water Affairs (DWA)	1998	Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. The intention of the Act is to promote the equitable access to water and the sustainable use of water, redress past racial and gender discrimination, and facilitate economic and social development. The Act provides the rights of access to basic water supply and sanitation, and environmentally, it provides for the protection of aquatic and associated ecosystems, the reduction and prevention of pollution and degradation of water resources. As this Act is founded on the principle that National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, a person can only be entitled to use water if the use is permissible under the Act. Chapter 4 of the Act lays the basis for regulating water use. The site falls within the D41J quaternary drainage region, this drainage region falls under Zone A, which refers to the amount of water that may be taken from the ground water resource, per hectare. According to the Revision of General Authorisations in terms of Section 39 of the National Water Act of 1998 (Act No. 36 of 1998), Zone C indicates that no water may be abstracted from a ground water resource without applying for a Water Use License. It should also be noted that if the development

			occurs within 500m from a wetland, a WULA may be required.
National Environmental Management: Waste Act (Act No. 59 of 2008)	Department of Environmental Affairs (DEA)	2008	NEMWA has been developed as part of the law reform process enacted through the White Paper on Integrated Pollution and Waste Management and the National Waste Management Strategy (NWMS). The objectives of the Act relate to the provision of measures to protect health, well-being and the environment, to ensure that people are aware of the impact of waste on their health, well-being and the environment, to provide for compliance with the measures, and to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being. Regulations No. R921 (of 2013) promulgated in terms of Section 19(1) of the National Environmental Management: Waste Act (59 of 2008) determine that no person may commence, undertake or conduct a waste management activity listed in this schedule unless a license is issued in respect of that activity. It is not envisaged that a waste permit will be required for the proposed development.
National Environment Management: Air Quality Act (Act No. 39 of 2004)	Department of Environmental Affairs (DEA)	2004	The object of this Act is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development. Regulations No. R248 (of 31 March 2010) promulgated in terms of Section 21(1)(a) of the National Environmental Management Act: Air Quality Act (39 of 2004) determine that an Atmospheric Emission License (AEL) is required for certain listed activities, which result in atmospheric emissions which have or may have a detrimental effect on the environment. The Regulation also sets out the minimum emission standards for the listed activities. It is not envisaged that an Atmospheric Emission License will be required for the proposed development.
The National Heritage Resources Act (Act No. 25 of	South African Heritage Resources Agency (SAHRA)	1999	The Act aims to introduce an integrated and interactive system for the management of the heritage resources, to promote good government at all levels, and empower civil society to nurture and conserve heritage resources so that they may be bequeathed to future generations and to lay down principles for governing heritage resources management throughout the Republic. It also aims to

1999)			establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources, to set norms and maintain essential national standards and to protect heritage resources, to provide for the protection and management of conservation-worthy places and areas by local authorities, and to provide for matters connected therewith. The Act protects and manages certain categories of heritage resources in South Africa. For the purposes of the Heritage Resources Act, a "heritage resource" includes any place or object of cultural significance. In this regard the Act makes provision for a person undertaking an activity listed in Section 28 of the Act to notify the resources authority. The resources authority may request that a heritage impact assessment be conducted if there is reason to believe that heritage resources will be affected. A case file has been opened on SAHRIS and all relevant documents were submitted for their comments and approval.
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983	The objective of the Act is to provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith. Consent will be required from the Department of Agriculture in order to confirm that the proposed development is not located on high potential agricultural land and to approve the long term lease agreement.

3.3 POLICY CONTEXT

Table 3.2: Policy context for the construction of solar PV plants

POLICY	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
Strategic Plan, 2015 – 2020	Department of Energy	2015	The strategic plan identifies six Departmental programmes. Programme 6 relates to clean energy. The purpose of this programme is to manage and facilitate the development and implementation of clean and renewable energy initiatives as well as EEDSM. Strategic objective 6.3 relates to effective renewable energy: To ensure the integration of renewable energy into the mainstream energy supply of South Africa by planning & coordinating initiatives & interventions focused on the development & improvement of the renewable energy market through: • facilitating the incorporation of renewable energy technologies into the IEP & other key energy policy documents; • resource mapping; • establishing a conducive environment for the growth of decentralised (renewable energy based) embedded electricity generation; • providing up-to-date data on performance & costs of renewable energy technologies as inputs to the IEP; • identity further development opportunities & providing necessary support to other renewable energy technologies that have the potential to contribute to the electricity, heat & transport sectors; • continuing support & monitoring of renewable energy initiatives & programmes that are already under way; and • implementing awareness campaigns to increase awareness of renewable energy & its benefits within the public sector & the general public.
The White Paper on the Energy Policy	Department of Minerals and Energy	1998	The White Paper on the Energy Policy of the Republic of South Africa establishes the international and national policy context for the energy sector, and identifies the following energy policy objectives:

of the Republic of South Africa			• Increasing access to affordable energy services • Improving energy governance • Stimulating economic development • Managing energy-related environmental and health impacts • Securing supply through diversity • Energy policy priorities The White Paper sets out the advantages of renewable energy and states that Government believes that renewables can in many cases provide the least cost energy service, particularly when social and environmental costs are included. The White Paper acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive and many appropriate applications exist. The White Paper notes that renewable energy applications have specific characteristics that need to be considered. Advantages include: • Minimal environmental impacts in operation in comparison with traditional supply technologies; and • Generally lower running costs, and high labour intensities. Disadvantages include: • Higher capital costs in some cases; • Lower energy densities; and • Lower levels of availability, depending on specific conditions, especially with sun and wind based systems.
The White Paper on Renewable	Department of Minerals and Energy	2003	This White Paper on Renewable Energy supplements the *White Paper on Energy Policy*, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing

Energy			renewable energy in South Africa. The White Paper notes that while South Africa is well-endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is: *10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW)* (Executive Summary, ix).
Integrated Resource Plan (IRP) for South Africa	Department of Minerals and Energy	2010-2030	The current iteration of the Integrated Resource Plan (IRP) for South Africa, after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. The document outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new build options, which was then "balanced" in accordance with qualitative measures such as local job creation. In addition to all existing and committed power plants, the RBS included a nuclear fleet of 9,6GW; 6,3GW of coal; 11,4GW of renewables; and 11,0GW of other generation sources. A second round of public participation was conducted in November/December 2010, which led to several changes to the IRP model assumptions. The main changes were the disaggregation of renewable energy technologies to explicitly display solar photovoltaic (PV), concentrated solar power (CSP) and wind options; the inclusion of learning rates, which mainly affected 38 renewables; and the adjustment of investment costs for nuclear units (a possible increase of 40%). Additional cost-optimal scenarios were generated based on the changes. The outcomes of these scenarios, in conjunction with the following policy considerations, led to the Policy-Adjusted IRP:

			• The installation of 38 renewables were brought forward in order to accelerate a local industry; • To account for the uncertainties associated with the costs of 38 renewables and fuels, a nuclear fleet of 9,6GW was included in the IRP; • The emission constraint of the RBS (275 million tons of carbon dioxide per year after 2024) was maintained; and • Energy efficiency demand-side management (EEDSM) measures were maintained at the level of the RBS. The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for 44renewable. In addition to all existing and committed power plants (including 10GW committed coal), the plan includes 9,6GW of nuclear; 6,3GW of coal; 17,8GW of 44renewable; and 8,9GW of other generation sources. The Policy-Adjusted IRP has therefore resulted in an increase in the contribution from 44renewable from 11,4 GW to 17,8 GW.
Northern Cape Provincial Development and Resource Management Plan/Provincial Spatial Development Framework (PSDF)	Northern Cape Provincial Government	2012	The Northern Cape Provincial Spatial Development Framework (further referred to as the PSDF) of 2012 in compliance with the Northern Cape Planning and Development Act 7 of 1998 (Chapter IV, Section 14), aims to "*ensure that the use and allocation of the province's resources, both renewable and non-renewable, are informed by a set of integrated and coordinated policies, objectives, implementation strategies, programmes and, where appropriate, projects aimed at:* • *setting and monitoring, where appropriate, measurable standards with regard to, amongst other, public access to health, safety, amenities, education and economic opportunity;* • *ensuring that the supply of public infrastructure is directed towards meeting the required standards in a prioritised, coordinated, sustainable and cost-effective way, in terms of capital and maintenance expenditure;* • *ensuring the protection and sustainable utilisation of land, water and air where these are important for the maintenance of ecologically-sensitive systems or processes, areas of biological diversity, public health or public amenities;* • *providing an investment and expenditure programme coordinated with budgetary cycles and*

capable of securing financial and other resources from National Government and any other funding agencies as well as public/private sector partnerships; and

- *informing and guiding the preparation and implementation of district and local municipal infrastructure management plans and land development plans" (PSDF 2012:4).*

The PSDF mainly aims to build a prosperous, sustainable growing provincial economy to firstly improve social development and to eradicate poverty. The PSDF adopted the International Union for Conservation of Nature's (IUCN) mission as their main goal. This goal states that essential ecological processes are being maintained, that natural resources are being preserved and utilised in a sustainable manner, that the use of the biosphere are managed while also maintaining its potential for future generations.

The PSDF of 2012 highlights that renewable energy sources such as solar thermal and wind, comprise 25% of the Northern Cape's energy generation capacity by the year 2020, and should be progressively phased in as appropriate into the province. The PSDF further sets out energy objectives, which include the following:

- To promote the development of renewable energy supply schemes;
- To enhance the efficiency of Eskom's power station at the Vanderkloof power station;
- Reinforce additional electricity supply especially renewable energy projects; and
- Develop and implement innovative energy technologies to improve access to reliable, sustainable and affordable energy services. Also recognize that the objective should be to obtain sustainable economic growth.

Lastly, the PSDF notes that the Northern Cape need to develop large-scale renewable energy supply schemes in order to address the growing demand in energy and to promote a green economy in the province.

Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa	Department of Environmental Affairs	2014	The Department of Environmental Affairs (DEA) has committed to contribute to the implementation of the National Development Plan and National Infrastructure Plan by undertaking Strategic Environmental Assessments (SEAs) to identify adaptive processes that integrate the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment. The wind and solar photovoltaic (PV) SEA was accordingly commissioned by DEA in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs). The REDZs also provide priority areas for investment into the electricity grid. Currently one of the greatest challenges to renewable energy development in South Africa is the saturation of existing grid infrastructure and the difficulties in expanding the grid. Proactive investment in grid infrastructure is thus likely to be the most important factor determining the success of REDZs. Although it is intended for the SEA to facilitate proactive grid investment in REDZs, such investment should not be limited to these areas. Suitable wind and solar PV development should still promoted across the country and any proposed development must be evaluated on its own merit. The proposed site does not fall within a REDZs.
John Taolo Gaetsewe District Municipality Integrated Development	John Taolo Gaetsewe District Municipality	2012 - 2019	The John Taolo Gaetsewe District Municipality's Integrated Development Plan for 2012-2019 (further referred to as "the Plan") highlights the achievements and challenges of the municipality. One of these challenges is that the growth in access to electricity as a primary source of energy in the district has been spectacular. Over the period of 2001-2007 electricity as a source of energy has increased to 90% in the district municipality. Thus there, has been a growth of 31.8 % over six (6) years. The Plan goes further by stating the development priorities of the municipality. They are:

Plan (IDP)			- Priority 1: Water and Sanitation; - Priority 2: Roads and Transport; - Priority 3: Local Economic Development (LED); - Priority 4: Land Development and Reform; - Priority 5: Integrated Human Settlements; - Priority 6: Sustainable Development Orientated Municipalities; - Priority 7: Environmental Management, Climate Change and Municipal Health; - Priority 8: Disaster Management; and - Priority 9: HIV/Aids and TB One of the long-term strategic objectives of the district, according to the Plan, that particularly relate to the proposed project is "Environmental Management, Climate Change and Municipal Health". Under this strategic objective one of the common issues that affect the district identified by the Plan is the use of solar energy for future purposes. The Plan goes further by stating that "serious investment in and exploitation of renewable sources of energy has not only resulted in the district becoming self-reliant in the generation of electricity, but seen it make a sizeable injection on the national electricity grid". Furthermore, the plan describes the local economic development strategy of the district. Key thrusts were identified. Thrust 5 (Industrial Development) relate to the proposed project. This thrust refers to the programmes that relate to the manufacturing projects identified and the associated enabling public sector interventions. This thrust also refers to the general improvement in living conditions, infrastructure and overall economic growth, which should serve as a boost of potential in this sector. An example of these projects includes solar energy plants.
Gamagara Local Municipality Draft	Gamagara Local Municipality	2015-2017	The vision of the Gamagara Local Municipality according to the Draft Integrated Development Plan for 2015-2017 (further referred to as the Plan) is to provide a prosperous community with a futuristic economy. The mission of the municipality is to "*provide universal sustainable services to the community in order to attain a safe and healthy environment, as well as socio-economic development by exploiting*

Integrated Development Plan (IDP)	*economic benefits and strengthening stakeholder relations."* The Plan is the process through which the municipality prepares a strategic developmental plan, which is the principal strategic development plan. This Plan also crosses departmental divisions by linking the physical, social, institutional and economic components of planning and development structures. It also integrates and aligns planning in the different sectors of government, thereby enforcing and upholding the spirit of co-operative governance in the public sector. The Plan makes the following policy pronouncements and performance targets that intersect with developmental mandates assigned to local government. This Plan further refers to the creation of employment initiatives in the area. The prospects for economic growth and development within the municipal area for the short – and long-term will focus on manufacturing, heritage and tourism, wholesale and retail trade and solar energy. According to the Gamagara Local Municipality Draft Integrated Development Plan for 2015 – 2017 the following were identified as the key priority areas for the years 2015 -2016, they are: basic service delivery, water and sanitation, electricity, roads and sanitation, mixed developing houses and construction of RDP houses.

3.4 OTHER LEGISLATION

Other legislation mainly refers to the following:

- Planning legislation governing the rezoning process and approval of the layout plan.
- Design standards and legislation for services provision such as water, sewerage, electricity, etc.
- Municipal bylaws related to building plans, building regulations, etc.

3.5 RELEVANT GUIDANCE

The following guidance was considered in conducting the EIA:

- The Equator principles III (2013)[1]
- World Bank Group Environmental, Health and Safety General Guidelines (EHS Guidelines) (2007)
- Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007)
- International Finance Corporation's Policy on Environmental and Social Sustainability (2012)
- DEA. (2013). Draft National Renewable Energy Guideline. Department of Environmental Affairs, Pretoria, South Africa
- DEA, (2012), Guideline 5 – Final companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010
- DEA, (2012), Guideline 7 – Public participation in the Environmental Impact Assessment process
- DEA, (2012), Guideline 9 – Need and desirability
- DEAT, (2006), Guideline 3 – General guide to the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 4 – Public participation in support of the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 5 – Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations
- BirdLife, (2015). Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa

3.6 CONCLUSION

The EIA was undertaken in accordance with the EIA Regulations (2014) published in GNR 982, in terms of Section 24(5) and 44 of the NEMA as amended as well as all relevant National legislation, policy documents, national guidelines, the World Bank EHS Guidelines, the IFC Performance Standards, and the Equator Principles.

[1] Although this report is not written in terms of the Equator Principles (EPs), it fully acknowledges that the EPs will need to be complied with should funding for the project be required.

4 THE NEED AND DESIRABILITY

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

Appendix 3. (3) An EIR (...) must include-

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

4.1 THE NEED FOR THE PROPOSED ACTIVITY

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 environmentally responsible development, the impacts of climate change and the need for sustainable development.

Over 90% of South Africa's electricity generation is coal based, the Word bank estimates that these results in an annual, per capita carbon emission of ~8.9 tons per person. Based on 2008 fossil-fuel CO_2 emissions statistics released by the Carbon Dioxide Information Analysis Centre, South Africa is the 13th largest carbon dioxide emitting country in the world and the largest emitter in Africa (Boden, et al. 2011).

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 Department of Energy (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 photovoltaic solar facility will significantly contribute to achieving this objective and will also address some of the objectives identified by the Gamagara Local Municipality's Integrated Development Plan such as ensuring economic growth in the region and creating long term employment (IDP, 2015-2017).

4.2 THE DESIRABILITY OF THE PROPOSED ACTIVITY

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 Northern Cape 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 CO2 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 453 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.

- Effective use of resources - Because of predominantly the climate and soil limitations, the site has limited suitability for cultivated crops, and viable agricultural land use is limited to grazing only. The moisture availability class 7 classification, with high variability of rainfall is a very severe limitation to agriculture, which makes any cultivation without irrigation completely non-viable. The very sandy soils, with very limited water holding capacity are a further limitation. The grazing capacity on AGIS is classified almost entirely across the site as 14-17 hectares per large stock unit. The proposed development in this specific area will generate alternative land use income through rental for energy facility, which will have a positive impact on agriculture. It will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve the financial sustainability of agricultural activities.

- Cumulative impacts of low to medium significance - Three other solar PV plants have been granted preferred bidder status within proximity radius of 30km to the proposed Boitshoko PV plant, while six (6) additional applications for solar farms have also been submitted. The Final EIR includes a detailed assessment of the potential cumulative impacts associated with the proposed development – refer to Section 7 of the report. No cumulative impacts with a high residual risk have been identified. In terms of the desirability of the development of sources of renewable energy therefore, it may be preferable to incur a higher cumulative loss in such a

region as this one, than to lose land with a higher environmental value elsewhere in the country.

- Increased access to electricity as a source of energy: The John Taolo Gaetsewe District Municipality's IDP for 2012-2019 highlights that the growth in access to electricity as a primary source of energy in the district has been spectacular. Over the period of 2001-2007 electricity as a source of energy has increased to 90% in the district municipality. The increased use of electricity as a source of energy may be linked to the increase urbanisation in this region. According to the Gamagara IDP of 2015/2016 the population in the local municipality increased with 79% from 2001 to 2011 and is growing at a rate of 5.84% yearly.

5 DESCRIPTION OF ENVIRONMENTAL ISSUES

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

Appendix 3. (3) An EIR (...) must include-

(g) A motivation for the preferred development footprint within the approved site (i) details of all the alternatives considered;

(h) a full description of the process followed to reach the proposed development footprint, within the approved site, including –

(i) details of all the development footprint alternatives considered;

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

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

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

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

(xi) a concluding statement indicating the preferred alternative development location within the approved site.

5.1 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.

An initial site assessment (refer to Appendix G) was conducted by the developer on the Remaining Extent of Portion 1 of the farm Limebank No. 471 and the farm was found favourable due to its proximity to grid connections, solar radiation, ecology and relative flat terrain. Some parts of the farm have been deemed not suitable for the proposed development such as areas surrounding farm structures (windmills, cattle loading bays, etc.) or near the non-perennial pans that are located around the selected sites. These factors were then taken into consideration and appropriate buffers were implemented to exclude them from the layout plan. The site selection also took the site geology, land capability,

water availability and land use into consideration before deciding on the specific site. From the information obtained, a single preferred alternative has emerged (Subsolar, 2016).

The following sections explore different types of alternatives in relation to the proposed activity in more detail.

5.1.1 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 grazing for cattle (refer to the photographs of the site). However, the potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost.

5.1.2 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 Boitshoko Solar Power Plant (RF) (Pty) Ltd. in the Kathu area to potentially establish solar facilities. From a local perspective, the Remaining Extent of Portion 1 of the farm No. 471 is preferred due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. agricultural potential, ecological sensitivity 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 livestock ranching and 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 7 and therefore the agricultural potential of the site is limited and it is highly unlikely that the change in land use will impact significantly on agricultural production (refer to figure 4 for an illustration of the land capability classification).

Two possible sites were identified on the Remaining Extent of Portion 1 of the farm Limebank No. 471. These sites are referred to as "the alternative" and "the preferred site". Each of these portions are more than 280ha in extent – refer to figure 11.

Preferred development site (white portion): This is the preferred option since there are only a few small pans near the site and the terrain is flat. This area would also require the shortest power line and access route to be created.

Alternative 1 (blue portion): This option contains more pans closer to the site and this option would also require a longer power line route to connect to the grid. This option would require a long access route to be created.

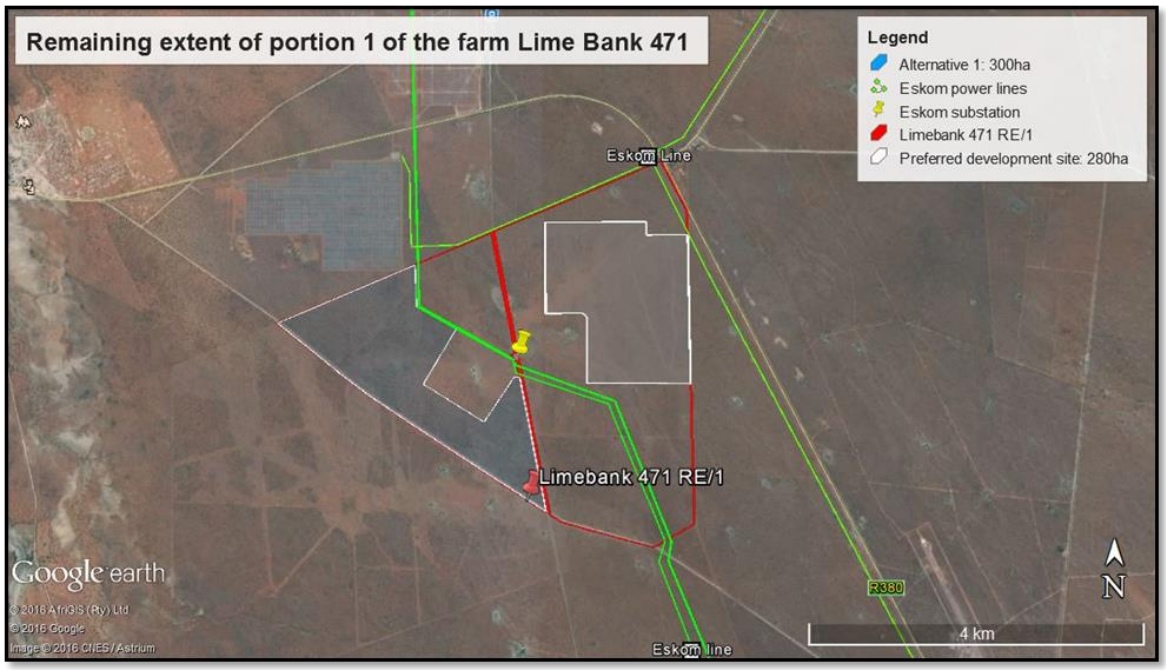


Figure 11: Location alternatives on the Remaining Extent of Portion 1 of the farm Limebank No. 471

5.1.3 Activity alternatives

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

Photovoltaic (PV) solar facility – Boitshoko Solar Power Plant (RF) (Pty) Ltd. is part of a portfolio of solar PV projects throughout South Africa. Boitshoko Solar Power Plant (RF) (Pty) Ltd. is of the opinion that solar PV technology is perfectly suited to the site, given the high irradiation values for the Kathu area – refer to figure 12.

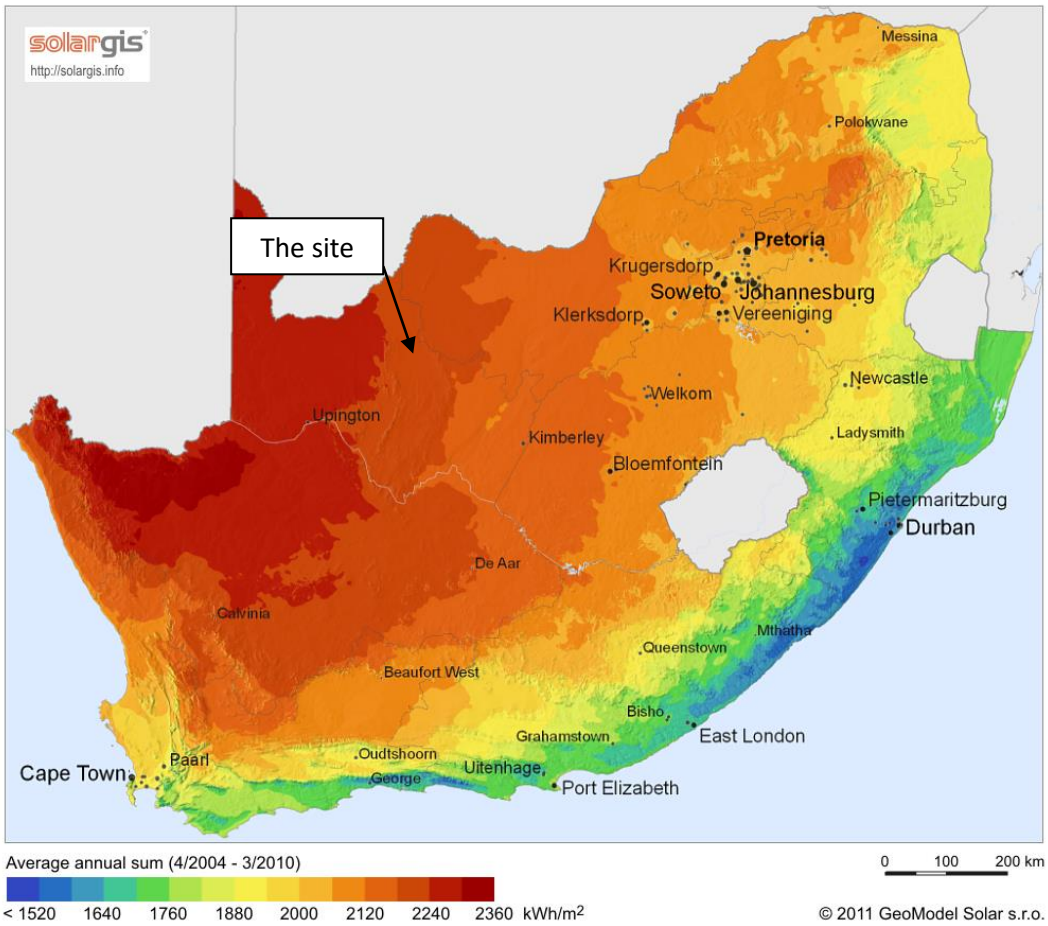


Figure 12: Horizontal irradiation for South Africa (SolarGIS, 2011)

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.

5.1.4 Technical alternatives

It is expected that generation from the facility will likely tie in with the Ferrum–Umtu 132kV power line. A transmission line will be constructed within 52m wide servitude corridor towards the power line which is the preferred alternative since it follows the shortest route.

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 Northern Cape 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).

The choice of structure to be used for the power line will be determined in consultation with Eskom once the Engineers have assessed the geotechnical and topographical conditions and decided on a suitable structure which meets the prescribed technical requirements. The choice of structures to be used will not have any adverse impacts on the environment. The line will be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd.

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.

Single Circuit Overhead Power Line

The use of single circuit overhead power lines to distribute electricity is considered the most appropriate technology and has been designed over may years for the existing environmental conditions and terrain as specified by Eskom Specifications and best international practice. Based on all current technologies available, single circuit overhead power lines are considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons:

- More cost effective installation costs
- Less environmental damage during installation
- More effective and cheaper maintenance costs over the lifetime of the power line.

Double Circuit Overhead Power Line

Where sensitive environmental features are identified, and there is sufficient justification, Eskom will consider the use of double circuit (placing 2 power lines on either side of the same tower structure) to minimize impacts. However, the use of double-circuiting has a number of technical disadvantages:

- Faults or problems on one power line may mean that the other power line is also disabled during maintenance, and this will affect the quality of supply to an area. Larger and taller towers as well as more towers are required for double-circuit power lines.

The double-circuit overhead power line proves more feasible since the single circuit may not have the capacity to transmit the large amount of electricity generated from the plant and during maintenance the entire plant would not have to be off line as one of the double circuit lines would still be able to supply electricity. However, due to the rapid requirement changes, this will only be determined before construction.

5.1.5 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 plan is included as an Appendix under Layout Plans.

It is envisaged that the following environmental features will need to be considered:

- How to accommodate any protected tree or plant species.
- How to avoid any pans surrounding the site.

For the layout of the Boitshoko Solar Power Plant – refer to Figure 13 and Layout Plans included as an Appendix to the report.

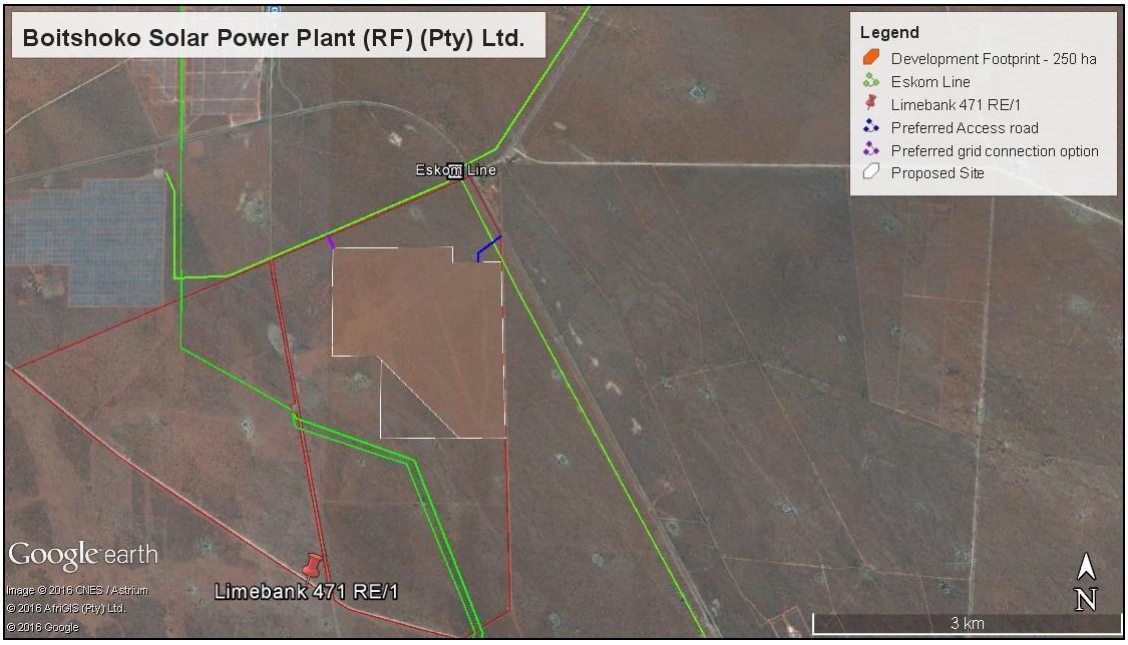


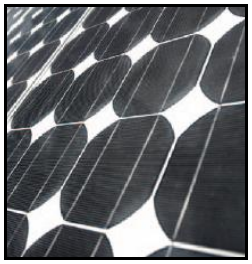
Figure 13: Preferred site on the Remaining Extent of Portion 1 of the farm Limebank No 471

5.1.6 Technology alternatives

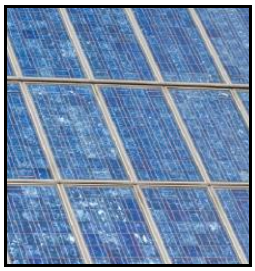
There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon and thin film. These technologies are discussed in more detail below:

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.



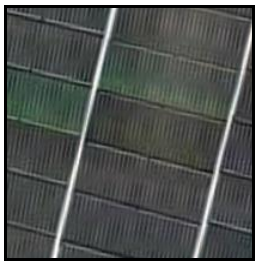
- Poly-crystalline Silicon – poly-crystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than mono-crystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than 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 (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability. However, due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used will only be confirmed at the onset of the project.

5.2 PUBLIC PARTICIPATION PROCESS

The following sections provide detailed information on the public participation process conducted in terms of Regulations 39 to 44.

5.2.1 General

The public participation process was conducted strictly in accordance with Regulations 39 to 44. 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 low environmental sensitivity of the site and the fact that no conflict was 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 extend 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 (Kalahari Bulletin) on the 17 March 2016 (see Appendix B) 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 30 days of the advertisement.

- Site notices

  Site notices were placed on site in English on 28 February 2016 to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs were given the opportunity to raise comments by 18 April 2016. Photographic evidence of the site notices is included in Appendix C.

- 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 and emails on 17 March 2016 and were requested to submit comments by 20 April 2016. For a complete list of stakeholder details see Appendix D and for proof of registered post see Appendix E. The consultees included:

  - The Department of Water Affairs and Forestry
  - The Provincial Heritage Resources Agency (PHRA), Northern Cape
  - The Wildlife and Environment Society of South Africa (WESSA)
  - The Northern Cape Department of Energy
  - The Northern Cape Department of Agriculture
  - The South African Heritage Resources Agency (SAHRA)
  - Passenger Rail Agency of South Africa (PRASA)
  - South African National Roads Agency (SANRAL)
  - SENTECH
  - Department of Communications
  - Northern Cape Department of Mineral Resources
  - Transnet
  - ESKOM
  - Square Kilometer Array (SKA)
  - The Civil Aviation Authority (CAA)
  - The Northern Cape Department of Public Works, Roads and Transport
  - National Energy Regulator of South Africa (NERSA)
  - The Municipal Manager at the John Taolo Gaetsewe District Municipality

- The Municipal Manager at the Gamagara Local Municipality
- The Local Councilor at the Gamagara Local Municipality
- Leads 2 Business – Melanie Miles
- Land owner - Mr. Hendrik van Der Merwe
- Wincanton 472 RE - San Solar Energy Facility (Pty) Ltd (land owner of power line route)
- Halliford 466 portion 3 - Kasselman trust
- Mash 467 RE - Sishen Iron Ore Company (Pty) Ltd.
- Limebank 471 portion 2 - Curtis Boerdery cc

It was expected from I&APs to provide their inputs and comments by 20 April 2016. To date comments have been received from Leads 2 Business and Mrs Stephanie Kasselman.

➢ <u>Direct notification of surrounding land owners and occupiers:</u>
Written notices were also provided to all surrounding land owners and occupiers on 17 March 2016. The Gamagara Local Municipality and other local property owners were contacted to obtain the contact details of the surrounding land owners; four farmer's contact details could be obtained – refer to figure 14. The surrounding land owners were given the opportunity to raise comments by 20 April 2016. To date only Mrs Stephanie Kasselman registered as an I&AP (see Appendix F for written comments). For a list of surrounding land owners see Appendix D.

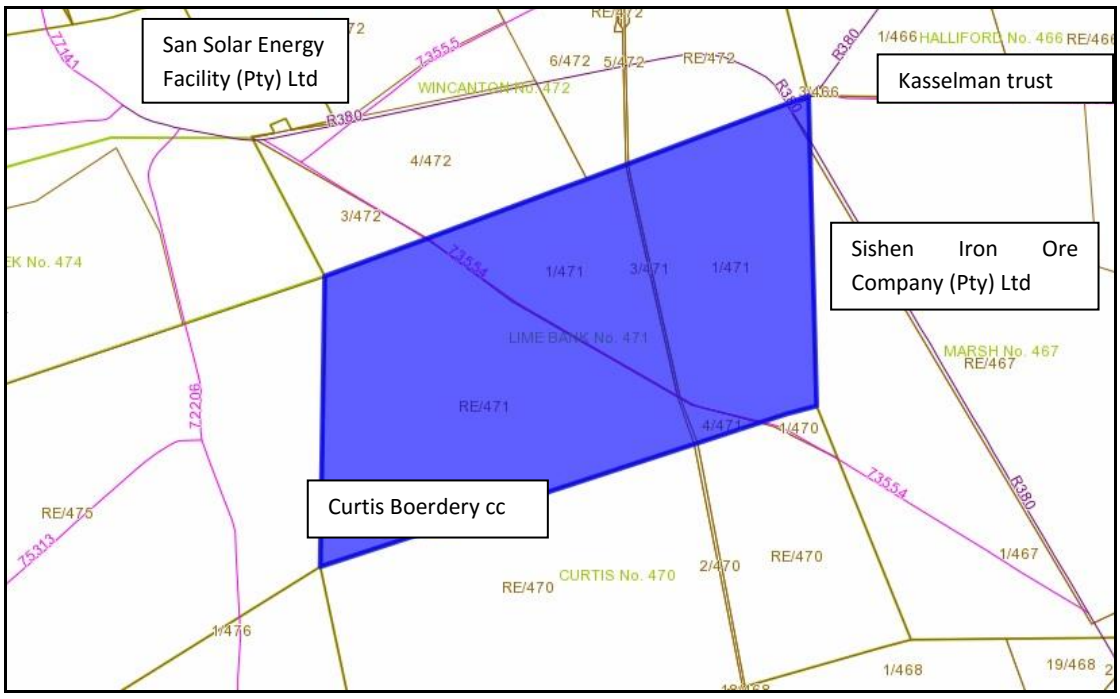


Figure 14: Surrounding Land Owners

➢ <u>Circulation of Draft Scoping Report</u>
The following registered I&APs and State Departments were informed of the availability of the Draft Scoping Report on 19 May 2016.

- The Department of Water Affairs and Forestry
- The National Department of Agriculture

- The Provincial Heritage Resources Agency (PHRA), Northern Cape
- The Wildlife and Environment Society of South Africa (WESSA)
- The Department of Energy
- The South African Heritage Resources Agency (SAHRA)
- Passenger Rail Agency of South Africa (PRASA)
- South African National Roads Agency (SANRAL)
- SENTECH
- Department of Communications
- Northern Cape Department of Mineral Resources
- Transnet
- ESKOM
- Square Kilometer Array (SKA)
- The Civil Aviation Authority (CAA)
- The Northern Cape Department of Public Works, Roads and Transport
- National Energy Regulator of South Africa (NERSA)
- The Municipal Manager at the Gamagara Local Municipality
- Land owner - Mr. Hendrik van Der Merwe

It was expected from I&APs to provide their inputs and comments within 30 days after receipt of the notification or copy of the Draft report (By 19 June 2016). To date only SAHRA provided comments (see Appendix F for written comments).

- Public participation meeting

All I&AP's were invited to attend the public meeting held at Kathuhari Guesthouse in Kathu on 23 June 2016 at 17:00 PM. The public meeting was an opportunity to share information regarding the proposed development and provide I&APs with an opportunity to raise any issues and provide comments. An advertisement was placed in English in the local newspaper (Kalahari Bulletin) on 16 June 2016 to notify the public of the public meeting. The following key stakeholders were also directly informed of the public meeting via email on 22 June 2016:

- The Department of Water Affairs and Forestry
- The National Department of Agriculture
- The Provincial Heritage Resources Agency (PHRA), Northern Cape
- The Wildlife and Environment Society of South Africa (WESSA)
- The Department of Energy
- The South African Heritage Resources Agency (SAHRA)
- Passenger Rail Agency of South Africa (PRASA)
- South African National Roads Agency (SANRAL)
- SENTECH
- Department of Communications
- Northern Cape Department of Mineral Resources
- Transnet
- ESKOM
- Square Kilometer Array (SKA)
- The Civil Aviation Authority (CAA)

- The Northern Cape Department of Public Works, Roads and Transport
- National Energy Regulator of South Africa (NERSA)
- The Municipal Manager at the Gamagara Local Municipality
- Leads 2 Business – Melanie Miles
- Land owner - Mr. Hendrik van Der Merwe

The attendance register for the public meeting is attached as Appendix J.

- Circulation of the Draft Environmental Impact Assessment Report:
  The following registered I&APs and State Department were informed of the availability of the Draft EIR on 2 September 2016 (refer to Appendix E):

  - Northern Cape Department of Environmental Affairs and Nature Conservation
  - The Department of Energy
  - The Department of Water Affairs and Sanitation
  - The National Department of Agriculture
  - The South African Heritage Resources Agency (SAHRA)
  - The Provincial Heritage Resources Agency (PHRA), Northern Cape
  - Passenger Rail Agency of South Africa (PRASA)
  - South African National Roads Agency (SANRAL)
  - SENTECH
  - Department of Communications
  - The Northern Cape Department of Mineral Resources
  - Transnet
  - ESKOM
  - Square Kilometer Array (SKA)
  - National Energy Regulator of South Africa (NERSA)
  - The Wildlife and Environment Society of South Africa (WESSA)
  - The Municipal Manager at the Gamagara Local Municipality
  - The Local Councilor at the Gamagara Local Municipality
  - The Civil Aviation Authority (CAA)
  - The Northern Cape Department of Public Works, Roads and Transport
  - Leads2Business – Ms. Melanie Miles
  - Land owner – Mr. Hendrik Venter
  - Northern Cape Occupational Health – Dr. Tidu van der Merwe
  - Northern Cape Occupational Health – Sr. Elna van der Merwe
  - Northern Cape Occupational Health – Mr. Herman Wagener
  - MSG Maintenance Incledon – Mrs. Beverley Smit
  - JTG Business Forum – Mr. Arthur Mosimane
  - JTG Business Forum – Mr. Kabelo Sechogela
  - JTG Business Forum – Mr. Tshepo Sechogela
  - JTG Business Forum – Mr. Bebe Kaware

To date no feedback was received.

5.2.2 Consultation process

Regulation 41 requires that the municipality, relevant ward councillor 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 notice as well as proof of correspondence is attached as Appendices D and E.

5.2.3 Registered I&APs

I&APs include all stakeholders who deem themselves affected by the proposed activity. According to Regulation 43(1) "*A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application*."

5.2.4 Issues raised by I&APs and consultation bodies

The comments received to date from consultation bodies are summarized in table 5.1. The full wording and original correspondence is included in Appendix F.

Table 5.1: Issues raised by I&APs and consultation bodies

Organisation	Person	Written comment (see Appendix F)
Leads 2 Business	Ms Melanie Miles	In an email dated 18 March 2016, Ms. Miles asked whether we could forward her the BID for the application and register her as an I&AP.
I&AP	Mrs Stephanie Kasselman	On a comments and response form (no date) Mrs. Kasselman expressed concerns about the visual impacts on the indigenous veld. She also expressed her concerns about the clearing of large areas of vegetation, the removal of topsoil and the creation of dust. She stated that the area is reliant on farming activity and she is worried about the potential for soil erosion, especially by wind.
AMDA Developments	Mr. Charlie Berrington	On 20 June 2016, in a telephone conversation with the EAP, Ms. Marélie Griesel, Mr. berrington requested to be listed as an I&AP.
SAHRA	Ms. Natasha Higgitt	In an email dated 20 May 2016, Ms. Higgitt informed the EAP of the requirements for submission to SAHRA.
SAHRA	Ms. Natasha	In an interim comments document, dated 23 June 2016,

	Higgitt	SAHRA provided comments on the DSR.
Northern Cape Department of Environmental Affairs and Nature Conservation		*To date no comments were received from the Department on the Draft Scoping reports or the Draft EIRs – Proof of submission to the Department is included in Appendix E.*

5.3 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PREFERRED ALTERNATIVE

The following sections provide general information on the biophysical and socio-economic attributed associated with the preferred alternative.

5.3.1 Biophysical environment

The biophysical environment is described with specific reference to geology, soils, agricultural potential, vegetation and landscape features, climate, biodiversity and the visual landscape. A number of specialists were consulted to assist with the compilation of this chapter of the report – refer to the table 1.2. 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 a number of indigenous and red data tree species that are located on the site as well as non-perennial wetlands.

5.3.1.1 Geology, soils and agricultural potential

The site features red sandy soils (Mispah, Hutton and Clovelly forms) which vary in depth from shallow to moderately deep. Rockiness of the soil surface varies. A number of non-perennial pans were observed in the vicinity of the site and were recorded for the sake of the potential ecological importance of these pans in the larger ecological system.

According to the Agriculture and Soils Impact Assessment (attached in Appendix H6) there is a single land type across the site, associated with predominantly shallow, sandy soils on underlying hardpan carbonate or rock. The geology is surface limestone, alluvium and red wind-blown sand of Tertiary to Recent age with a few occurrences of amygdaloidal andesitic lava (Ongeluk Formation). Soils are predominantly of the Hutton soil form, with lesser coverage of shallow Mispah form.

The site is of the Kathu Bushveld vegetation unit. The land capability is classified as Class 7 - non-arable, low potential grazing land. The site has a grazing capacity of 14-17 hectares per large stock unit. The land capability is classified as Class 7 -non-arable, low potential grazing land. The site has a grazing capacity of 14-17 hectares per large stock unit. The significance of all agricultural impacts is influenced by the fact that the site has climate limitations regarding moisture availability, as well as soil imitations with shallow soils and hardpan rock, making it unsuitable for cultivation and the land use is therefore limited to grazing.

A comment from an I&AP raised the issue of potential increased wind erosion with the removal of vegetation for the proposed project. The soils are classified as having low to moderate susceptibility to water erosion and as highly susceptible to wind erosion. There is however no evidence of significant erosion or other land degradation on the site. The site is of the Kathu Bushveld vegetation unit. The impact has been identified during the Agricultural and Soils Impact Assessment (refer to Appendix H6) and management measures will be implemented to mitigate the impact.

Underlying geology and air quality

The Asbestos Mountains are a range of hills in the Northern Cape province of South Africa, stretching south, south-west from Kuruman, where the range is known as the Kuruman Hills, to Prieska. The range lies about 150 km west of Kimberley and rises from the Ghaap Plateau. The mountains were named for the asbestos which was mined in the 1900s and is found as a variety of amphibole called *crocidolite*. Veins occur in slaty rocks and are associated with jaspers and quartzites, rich in magnetite and brown iron-ore.

During the mining process, asbestos would regularly go airborne and spread to nearby towns. When people inhaled the dust, they experienced what is known as environmental exposure. One field study conducted from 1960 to 1962 in the Northern Cape cities of Prieska, Kuruman and Koegas (The Mesotheloma Centre, 2016) confirmed that people living in proximity to these mines and mills faced risks of contracting asbestosis, a noncancerous asbestos-related disease.

The authors also reported that “an alarmingly high number of cases with mesothelioma of the pleura had been discovered among people who have lived in the Northern Cape and that there is evidence that this condition is associated with exposure to asbestos dust inhalation which need not be industrial,” (The Mesothelioma Centre, 2016).

Seeing that the proposed site falls within the Ghaap Platau and is located in relatively close proximity to the Asbestos Mountains, the risk of Asbestos exposure during the construction phase, when vegetation will be removed, soil will be disturbed and excavations will take place, could potentially exist. Special attention should be given to determining soil compositions before the commencement of the construction phase to determine if any asbestos deposits are present at the site. Dust pollution should also be avoided or minimised, to insure the safety of workers on site, and nearby communities at all times.

5.3.1.2 Vegetation and landscape features

The Kathu Bushveld vegetation type, under which the site is classified, is described by Mucina and Rutherford (2006) as ‘least threatened’. The Kathu Bushveld is characterised by a mostly open landscape with a shrub layer, a medium-tall tree layer in places and some fewer mature A*cacia trees* – refer to Plates.

The areas studied are mostly flat sandy plains with shrubs and few tall trees and some small interspersed pans of which none are found on the preferred site and only one on the alternative site. No threatened ecosystems were recorded in or in the vicinity of the study area.

The vegetation is dominated by tall woody shrubs, where for the largest part of the study area the average height for theses shrubs is 1.5-2.0m. A smaller area is covered by lower shrubs of 0.5-1.5m. The areas with lower shrubs generally also have a better grass cover and are mostly situated on shallower, rocky soils. Ten (10) plant species of specific conservation significance were recorded in the study area during the study period. Two are listed by Raimondo et al (2009) in the South African Red Data list as Declining species. Two tree species are included in the protected tree species list published by the National Forests Act (Act no.84 of 1998) (NFA, 1998), and nine of the 10 are listed as protected by the Northern Cape Nature Conservation Act (Act no. 9 of 2009) (NCNCA, 2009). Prominent, but not dominant trees are *Boscia albitrunca* and *Acacia erioloba.*

Figure 15: Examples of Boscia albitrunca and Acacia Erioloba

Red Data, Protected and Endemic Plant Species

According to the Ecological Fauna & Flora Habitat Survey (refer to Appendix H2) ten plant species of specific conservation significance were recorded in the study area during the study period. Two are listed by Raimondo et al (2009) in the South African Red Data list as Declining species. Two tree species are included in the protected tree species list published by the National Forests Act (Act no.84 of 1998) (NFA, 1998), and nine of the 10 are listed as protected by the Northern Cape Nature Conservation Act (Act no. 9 of 2009) (NCNCA, 2009). No species listed as Threatened or Protected Species (ToPS) by the National Environmental Management: Biodiversity Act's (Act No. 10 of 2004) list of ToPS as published in Government Gazette no. 36375 of 16 April 2013 (NEMBA ToPS, 2013), were recorded in the study area during this study.

Alien Invasive Species

According to the Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) the one invasive alien species that was recorded is the woody species *Prosopis glandulosa* var. *torreyana.* Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the development/ decommissioning footprint.

Pans

A number of non-perennial pans and drainage lines were recorded in the vicinity of the site. None of these pans actually occur on the preferred site and only one on the alternative site,

but were studied none the less because of their proximity to the site and their potential ecological importance in the larger ecological system within which the study area falls.

A buffer zone of 32 m from the edge of all pans, as prescribed for wetlands in Government Notice R.544 in Government Gazette 33306 of 18 June 2010, was delineated and mapped for all pan areas as the pans have limited sensitivity. According to the Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) it is anticipated that the proposed development would not have a major influence on the hydrological regime of the depression at the site.

No threatened plant or animal species are suspected to be present at the site. Given the present restricted nature of the wetlands around the site, as well as the lack of threatened species, it is recommended that proposed developments, if approved, focus on maintaining the integrity and functioning of a small depression in a low rainfall area (below 500 mm per annum). The type of development proposed, if approved, does not have the same impact as for example a plantation or buildings in terms of shade effects on the flora and fauna, and more importantly, on buffer zones or corridors.

Pans act as well-used bird areas where a variety of birds come to drink and could attract wetland bird species during times of high rainfall if the pans fill with water. Wetland bird species were not observed on site, but cannot be disregarded as the study was done during a drought period.

A buffer zone of 32 m would be deemed sufficient, given the type of development and the restricted nature of the pans, and is thought to be adequate to maintain the functioning thereof at the site. However, extra precaution was taken and a buffer of 500m will be implemented which will exclude the need for a WULA.

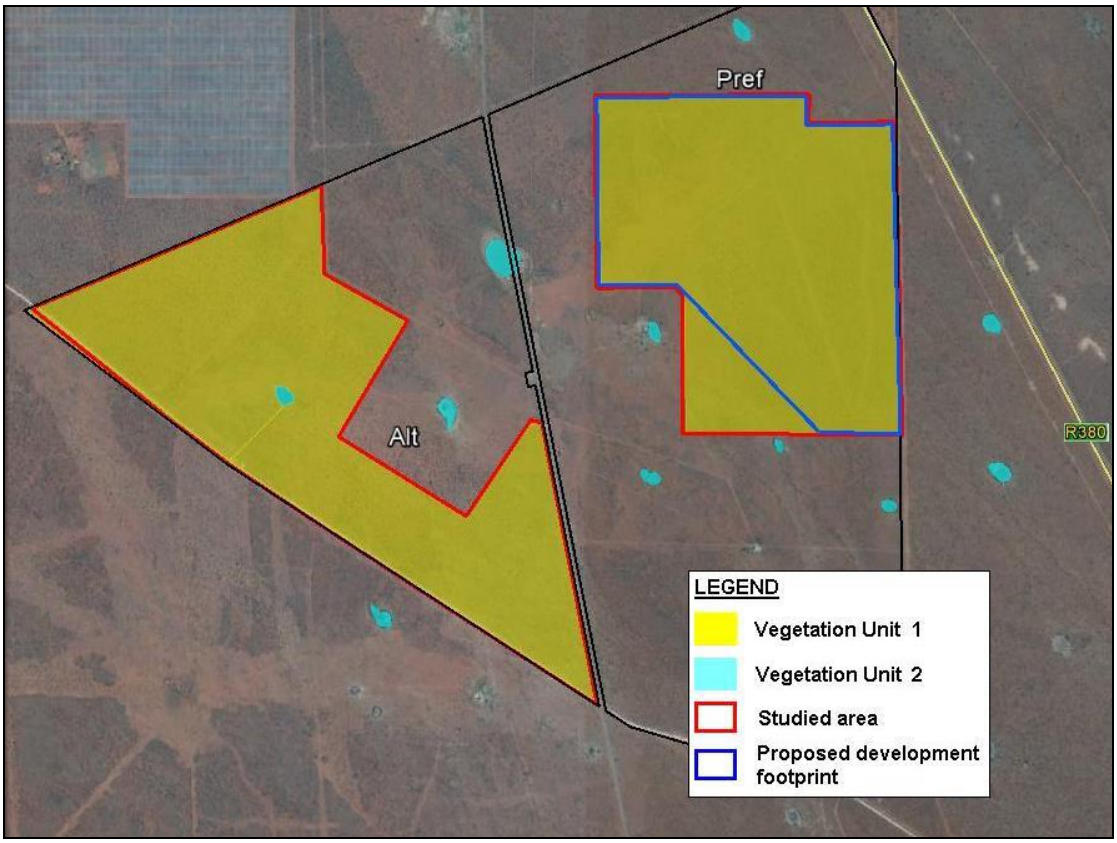


Figure 16: The two vegetation units on the site, where the pans fall under Vegetation Unit 2

5.3.1.3 Climate

According to Mucina and Rutherford (2006) rainfall peaks in summer and autumn with very dry winters. The mean annual precipitation (MAP) ranges from 220-280 mm with frequent frost in winter. Mean maximum and minimum temperatures for the area in question are 37°C in December and 2.2°C in July, respectively.

Fthenakis and Yu (2014) published a paper on the *Analysis of the Potential for a Heat Island Effect in large Solar Farms.* The study focused on the effect on global climate due to the albedo change from widespread installations of solar panels and found that the air temperature at 2.5m of the ground in the centre of the simulated solar farm selection was 1.9°C higher than the ambient air temperature, but that it declined to the ambient temperature at the height of 5 to 18m of the ground. The data also showed a clear decline in air temperature (within 0.3°C) 300m away from the solar farm. The solar panels also cool completely at night, and it is thus unlikely that a heat island effect could occur. The simulations also showed that the access roads between the solar fields allow for substantial cooling, and therefore, it is unlikely that an increase of size of the solar farm will affect the temperature of the surroundings.

5.3.1.4 Biodiversity

The primary cause of loss of biological diversity is habitat degradation and loss (IUCN, 2004; Primack, 2006). In the case of this study special attention was given to the identification of

sensitive species or animal life and birds on site. The following section will discuss the state of biodiversity on the site in more detail.

5.3.1.4.1 Avifaunal

According to the Avifaunal Studies conducted in March and August 2016 (refer to Appendix H3) the site proposed for the development has vegetation dominated by dense stands of *A. melifera* and a few tall Camelthorn trees (*Vachellia erioloba*). Grass cover is highly variable depending on rain and grazing pressure. During the assessment, rain had fallen, thunderstorms were active in the area and the veld was green, the trees were in leaf and some grass sward layer was apparent. Thus, this can be seen as a wet-season assessment with a flush of vegetation and grass. The Avifaunal Study recorded Seventy-six (76) avian species in or around Limebank farm of which 4 are collision-prone (Martial Eagle *Polemaetus bellicosus,* Black-chested Snake-Eagle *Circaetus pectoralis,* Pale Chanting Goshawk *Melierax canorus,* Greater Kestrel *Falco rupicoloides*). The Martial Eagle, an Endangered species, occurred on the pylons just outside the alternative PV site.

In the thicket, relatively low species richness of smaller birds (ave 16 species km^{-1}) but healthy numbers of birds (36 birds km^{-1}) were found. The Passage rate of the large collision-prone birds was 0.0 birds per of observation, as none were observed traversing either the preferred or alternative sites. Other species that may be attracted to the panels such as wetland birds (2 sp) or sandgrouse were present but in low numbers. Territorial Yellow-billed Hornbills Tockus leucomelas that may pose a risk to the panels by attacking their own reflections were recorded on site in low numbers.

If the proposed mitigation measures are followed to minimize any impacts to the threatened raptors highlighted, it is recommended that this solar site development go ahead, with a full post-construction monitoring protocol in place as it does so.

The avifauna of the area may be affected by the infrastructure of the PV plant but based on the avifaunal analysis of the number of birds on site suggests the impact will be minimal based on one site visit in the wet season. It is foreseen that if the recommendations made by the Avifaunal Study (Appendix H3) are followed and prove effective, Boitshoko Solar PV could proceed with the least impact to the avifauna of the area.

5.3.1.4.2 Ecological

Through a literature research the Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) confirmed that no animals recorded in the study area were restricted or endemic to the area. The plausible reptile species richness of the area (28 species were identified) was negatively affected by the wealth of crown cover as well as a lack of rockiness or sandy substrates interspersed throughout the farm. For the most part of the year the likelihood of any amphibians occurring in the area is low but there is no doubt some species would gather at the pans after good rain. No physical record of the listed butterfly occurring in the area exists, but has been included due to the close proximity of the nearest record (i.e. Hotazel) and its “Data deficient” status. Furthermore, the species is endemic to the region

and has habitat preferences corresponding with the environmental characteristics of the farm.

The area is visibly transformed with signs of overgrazing (bush encroachment). Some areas are very densely populated by trees and large shrubs. The area is not particularly sandy with ground cover showing some regeneration after the farm-owner removed his cattle. No ecosystems that are threatened and in need of protection according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) was recorded in or in the vicinity of the study area.

5.3.1.5 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 the presence of mines in the area which have an extremely negative visual impact. However, due to the extent of the proposed development a visual impact study was conducted to determine to what extent the proposed development will be visible to observers and whether the landscape provides any significant visual absorption capacity.

Regarding service development, motorists on the R380 regional road are likely to be impacted, especially if the preferred site is chosen, since there are little to no screening of visual impacts from the road. This will be applicable mainly to tourists and people that are not residents in the area. The alternative site is located 2,7km west from the R380 with some existing screening. The majority of the affected area falls within the agricultural development area. A small number of nearby farmsteads will be affected for the duration of the construction period (~15 months) and the lifespan of the development (25 years). The residents of the towns of Kathu and Deben are unlikely to be sensitive to the proposed development due to the fact that Kathu and Deben are “mining towns”. Residents of these towns have been living with a negative visual impact since 1953.

Landscape features

The farm Limebank 471 is currently vacant and surrounded by other vacant farmland and mine property. The farms in the area are mainly used for livestock grazing and other nearby property for mining. The proposed development is located approximately 13km north west from the town of Kathu, next to the R380 between the towns of Kathu and Deben. Although the site itself offers a pleasant rural view, the nearby area is mainly used for iron ore open cast mining with an existing highly negative visual impact.

The farm is located in an area with relatively low significance in elevation, meaning that the farm is not located on a mountain, at the foot of a mountain or in an area with a significant difference in elevation.

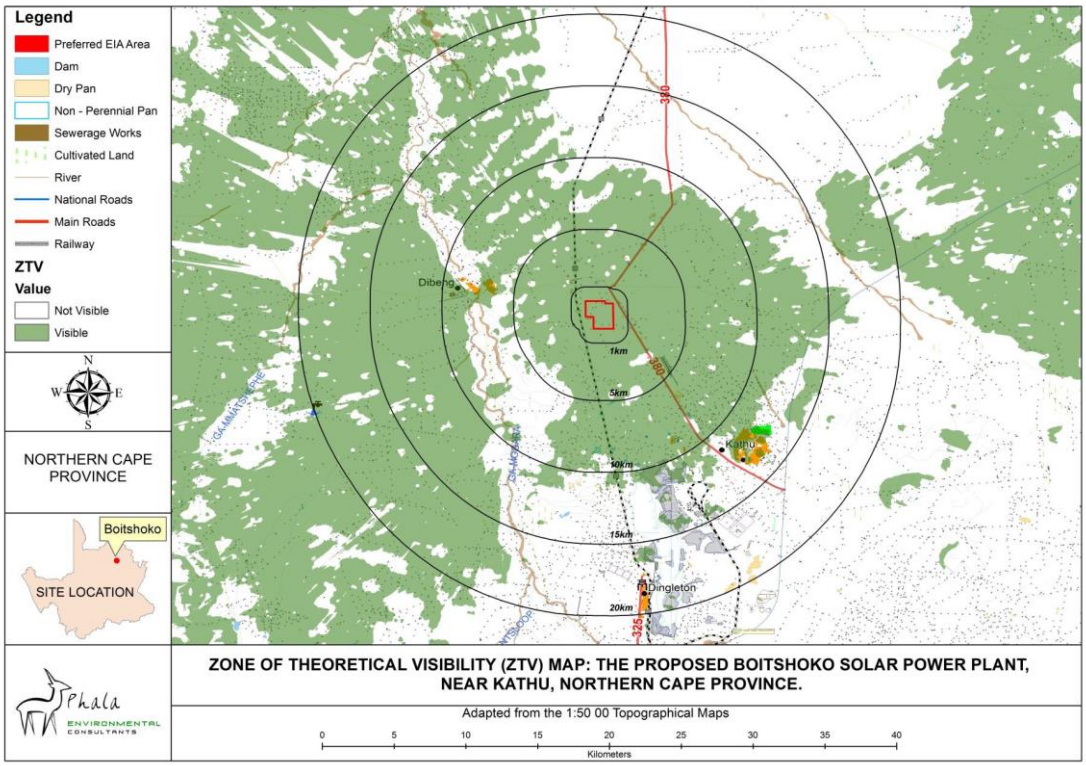


Figure 17: Zone of Theoretical Visibility

The preferred and alternative sites lie at the same height above sea level, where the Town of Kathu is slightly higher and the town of Deben slightly lower. Regarding visibility of the preferred and alternative sites, although the landforms and vegetative cover is not likely to limit visibility of the site, the visibility is of low significance

5.3.1.6 Traffic consideration

The site is located in the Northern Cape Province approximately 65km southwest of the town of Kuruman and approximately 21km northwest of the town of Kathu on Provincial Route 380 (R380). The photovoltaic equipment will be delivered to site from two possible locations being Cape Town Harbour, 1157km from site, or Durban Harbour, 1055km from site – Refer to figure 18. The site identified for this development is located off Provincial Route 380 on the farm, Limebank No.471.

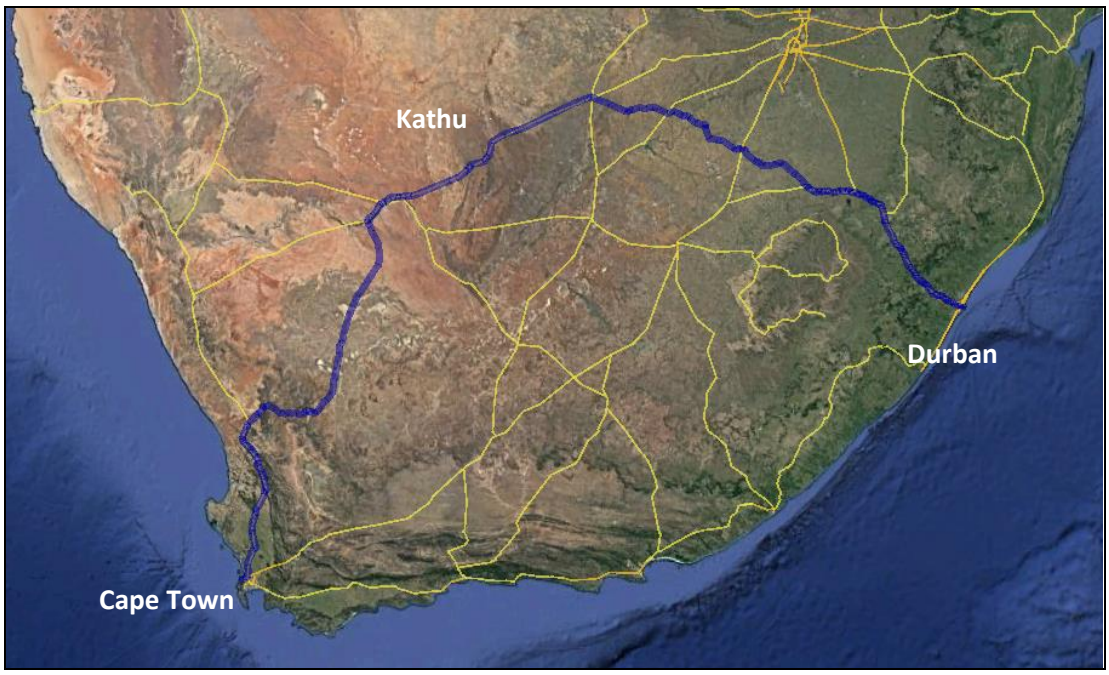


Figure 18: Transportation Routes

None of the new services that will be installed will be crossing any National Road Reserves. However, as the main access to the proposed facility is on a Provincial Route, a formal access application was applied for with the Northern Cape Department of Roads and Public Works, which has been approved in principle – Refer to Appendix K.

The vehicles used to transport the photovoltaic equipment are standard container trucks and not Abnormal Load Vehicles. As this route is travelled by the same type of vehicle throughout, no obstacles (e.g. low overhead services, cattle grids, narrow bridges etc.) are expected. Additionally, the local traffic during construction generated by commuting staff is estimated as follow (expected to be peak hour trips):

- Approximately 300 staff will be transported to site, most probably from Kuruman, Kathu or Deben on a daily basis. It is expected that minibus transport will be used for this.

- This translates to approximately 60 minibus vehicles travelling to and from site daily.

The following traffic figures are expected during the operational period:

- Average of 6 light vehicles per day with a maximum of 15 vehicles per day.

- Four mini-bus trips per day for permanent staff transport.

The ultimate accepted capacity of a two lane highway is 3 200 vehicles per hour (vph). From historic traffic count data, it was observed that the roadways around Kuruman have an abundance of spare capacity, (specifically along the N14 and R31) as the current average daily traffic (ADT) along these roadways are between 2 000 vpd and 6 000 vpd. This therefore indicates that the estimated additional traffic generated by the construction staff travelling to and from site, can be accommodated on the existing roadways.

Table 5.2: Trip Summary for Long Distance Route

Route Description	Delivery trips (None peak)	Construction Vehicle Trips (None peak)	Cumulative trips for six SPPs
Durban to Kuruman via N14	22 vpd	10 vpd	192 vpd
Cape Town to Kuruman via N14	22 vpd	10 vpd	192 vpd
Commuter traffic	-	-	360 vpd

It is expected that the community of Kuruman, Kathu and Deben will participate in the construction phase of this development. The development of the solar farms in the surrounding area, creates an opportunity for temporary employment and economic upliftment of the surrounding communities. The following traffic load figures are expected during the construction period. From a traffic point of view, the total daily construction traffic is deemed to be very low and will not significantly impact these communities.

5.3.2 Description of the socio-economic environment

The socio-economic environment is described with specific reference to social, economic, heritage and cultural aspects.

5.3.2.1 Socio-economic conditions

The development of the Boitshoko Solar Power Plant (SPP) has a variety of associated socio-economic benefits. In terms of employment the construction phase will employ approximately 400 semi-skilled employment opportunities over a period of 18 – 24 months. The operational phase however, will employ approximately 53 employment opportunities over a period of 20 years.

It is reported by the John Taolo Gaetsewe District Municipality IDP of 2012 – 2016 that in 2007 the mining sector in the district was the most significant contributor to the district's GDP (49.6%). Other contributors included the government services sector (12.6%), the trade sector (9.1%) and the finance and business services (7.7%). Through these figures it is evident that this district heavily relies on the mining sector. The IDP of John Taolo Gaetsewe District Municipality sets out the following objectives for the integrated development of the Gamagara Local Municipality: (1) to render quality, effective and sufficient services; (2) to promote the general wellbeing through a safe and healthy environment amongst all residents; (3) to promote equality and fairness in the allocation of resources; and (4) to promote sound and sustainable economic growth in the municipal area.

According to the 2011 Census the population of this municipal area consist of 41 617 people. According to the Gamagara IDP of 2015/2016 the population increased with 79% from 2001 to 2011 and is growing at a rate of 5.84% yearly. The majority of the population is considered to be black (55%), while 28.7% are coloured and 14% of the population white. Afrikaans and Tswana are also the most spoken languages in this municipal area.

The IDP of 2015/2016 of the Gamagara Local Municipality indicates that the literacy level of this municipal area is low with only 24.9% of the population with matric and only 3.6% that went through higher education. With regards to employment, the majority of the employment sector is male, with most of the females unemployed or as discouraged work-seekers. According to the IDP most of the job creation initiatives should be targeted at females for the majority of the females are economically inactive. The IDP further states that according to the 2011 Census 17.7% of the Gamagara population were unemployed and 65% of those constitute to the youth. The majority of the population in this area also have no monthly income, therefore development initiatives should be directed towards them.

According to the Gamagara Draft IDP of 2015-2017, the mining sector is the key economic driver for this municipal area. The IDP states that 43% of the employed population in this municipal area are employed in the formal sector, while 5% are employed in the informal sector.

5.3.2.2 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 (HIA) has been conducted to ensure that there would be no impact on cultural or historical features as a result of the proposed activity.

According to the Heritage Impact Assessment (attached as Appendix H7) the cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age) occupation and a much later colonial (farmer) component. The second component is an urban one consisting of a number of smaller towns, most of which developed during the last 150 years or less.

Early history

Occupation of the region took place during the Stone Age. Most of this, however, seems to date to the Early Stone Age and centres in the areas where there are hills, e.g. to the east and south. Kathu Pan is formed by a shallow depression with an internal drainage and a high water table. Archaeological and palaeo-environmental data from Kathu Pan and Kathu Townlands were used to reconstruct changes over time in the prehistoric environment (Beaumont 2004). The transitional Fauresmith at Kathu Pan has been dated to ca. 500 000 BP (Porat et al. 2010). A current research project at Kathu Pan 1 established a date of 500 000 years for a Fauresmith blade assemblage where blades were systematically removed from prepared cores (Porat et al. 2010; Wilkens & Chazan 2012).

The LCT's from this area often contain very fine handaxes. At Kathu Townlands an outcropping of banded ironstone that covers a large area of around 25 km contains enormous quantities of flaked items. A variety of handaxes, long blades, convergent flakes/points and scrapers have been found in Fauresmith collections. Middle Stone Age tools were also recovered from the Kathu localities (Beaumont 2004). A number of stone tools dating to the Fauresmith assemblage and Middle Stone Age were identified on the rim

of a small pan-like depression occurring adjacent to the old farmstead. The density is approximately 1 stone tool/5m2 (see Appendix H7).

Early Iron Age occupation did not take place in the region and seems as if the earliest people to have settled here were those of Tswana-speaking origin (Tlhaping and Tlharo) that settled mostly to the north and a bit to the west of Kuruman. Less obvious in its presence are the Later Stone Age sites, some of which are indicated by Beaumont & Vogel (1984). They equate these sites, some which occur in the larger region, with Cape Coastal pottery associated with amorphous LSA (herders) or Wilton (hunter-gatherers) in the period 100 BC to AD 1900.

Historic period

Although prospecting for minerals, especially diamonds occurred in the area and some knowledge was available on the iron deposits, it was only during the 1940s that the extent of the iron and manganese deposits were established, this was followed by the establishment of towns such as Sishen (1952) and Kathu in 1972. As already indicated, the larger region as well as the study area has been sparsely populated and has largely been used for cattle farming.

The site was visited on 23 March 2016. The area was investigated by travelling transects across it, giving special attention to features such as hills, outcrops and clumps of trees – refer to figure 19 below.

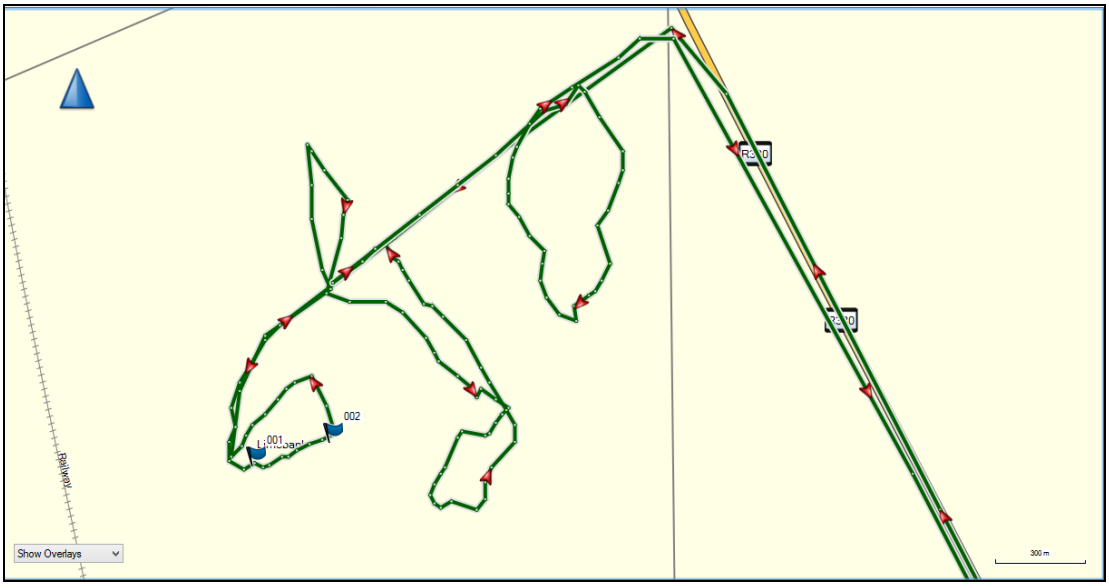


Figure 19: Map indicating the track log of the field survey

Table 5.3 is a summary of the heritage resources identified by the Heritage Impact Assessment (attached as Appendix H7) in the study.

Table 5.2: Summary of identified heritage resources in the area

Identified heritage resources			
General protection (NHRA)	**Coordinates**		**Description**
Archaeological site or material (Section 35)	S 27.61432	E 22.95034	A number of stone tools dating to the Fauresmith assemblage and Middle Stone Age were identified in the vicinity of a small pan-like depression. The density is approximately 1 stone tool/5m^2.
Graves or burial grounds (Section 36)	S 27.61363	E 22.95297	A small informal burial place was found in an overgrown area and it is therefore difficult to establish the correct number of graves, although there might be as many as five. The graves are all only marked with packed stones, although one seems to have been fenced off in the past.

From a heritage point of view, it is recommended that the proposed development be allowed to continue on condition that the following is included in the environmental authorisation:

- It is recommended that the burial site is retained and it should be permanently fenced off, leaving a buffer zone of at least five metres from the outer edge of the graves. If the graves cannot be retained, it should be relocated, but only on condition of following the correct procedures.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

Palaeontology

The Palaeontological Impact Assessment (refer to Appendix H8) indicates that the proposed development footprint, including both the preferred and one alternative site, is underlain by well-developed Kalahari Group surface limestones (Tl), calcretes and wind-blown sands of low to moderate palaeontological sensitivity, but impact on palaeontological heritage resources is on the whole considered to be low, as no potentially palaeontologically significant karst features were identified within the boundaries of the Boitshoko SPP footprint. As far as the palaeontological heritage is concerned, the proposed Boitshoko SPP development with associated transmission line may proceed with no additional mitigation or further palaeontological assessments required.

5.4 SITE SELECTION MATRIX

Due to the nature of the proposed development, the location of the facility is largely dependent on technical and environmental factors such as solar irradiation, climatic conditions, topography of the site, access to the grid and capacity of the grid. The high solar irradiation experienced in the Northern Cape indicates to a huge potential for the generation of power from solar.

The receptiveness of the site to PV development includes the presence of optimal conditions for the sitting of a solar energy facility due to high irradiation values and optimum grid connection opportunities. The Remaining Extent of Portion 1 of the farm Limebank No. 471, where the project is proposed to be located is considered favourable and suitable from a technical perspective due to the following characteristics:

- Climatic conditions: Climatic conditions determine if the project will be viable from an economic perspective as the solar energy facility is directly dependent on the annual direct solar irradiation values of a particular area. The Northern Cape receives the highest average of direct normal and global horizontal irradiation in the country, daily. This is an indication that the regional location of the project includes a low number of rainy days and a high number of daylight hours experienced in the region. Global Horizontal Radiation of ~2200 kWh/m^2/year is relevant in the area.

- Topographic conditions: The surface area on which the proposed facility will be located has a favourable level topography, which facilitates work involved with construction and maintenance of the facility and ensures that shadowing on the panels do not occur.

- Extent of the site: A significant portion of land is required to evacuate the prescribed 115MW and space is a constraining factor in PV facility installations. Provision was made to assess a larger area than is required for the facility to make provision for any other environmental or technical constraints that may arise and avoiding those areas. Larger farms are sought after to make provision for any constraints imposed by the Department of Agriculture on the extent of land that may be used for such facilities per farm. The Remaining Extent of Portion 1 of the farm Limebank No. 471 is 1 295.5232 hectares in extent.

- Site availability and access: The land is available for lease by the developer. Reluctant farm owners or farmers over capitalizing hamper efforts to find suitable farms. Access will be easily obtained from the R380 Regional Road.

- Grid connection: In order for the PV facility to connect to the national grid transmission line will be constructed within a 36m wide servitude towards the Ferrum–Umtu 132kV power line. Available grid connections are becoming scarce and play a huge role when selecting a viable site.

- Environmental sensitivities: From an environmental perspective the proposed site is considered highly desirable due to limited environmental sensitivities in terms of geology, and soils, agricultural potential, vegetation and landscape features, climate,

biodiversity and the visual landscape – refer to Section 5.3.1 of this report. Nothing of note was identified from an ecological or conservation point of view on the site apart from the non-perennial pans, a limited amount of red listed or protected fauna and flora.

It is evident from the discussion above that Remaining Extent of Portion 1 of the farm Limebank No. 471 may be considered favourable and suitable in terms of these site characteristics. The challenge was therefore to identify the preferred location for the proposed development within the boundaries of the farm. The site selection matrix (refer to table 5.4) compares the two alternative locations on the farm against the site selection criteria explained above.

Table 5.4: Site selection matrix

For ease of reference the favourability of the sites are colour-coded as follow:

Favourable	**A**	Mostly favourable	**B**	Mostly not favourable	**C**	Not favourable	**D**

Site selection criteria	Preferred site	Alternative site	Comments / Discussion
Location	A	A	• Both sites are located in an area with a Global Horizontal Radiation of ~2200 kWh/m2/year.
Grid connection	A	A	• Both sites are able to connect to the Ferrum -Umtu 132kv power line. • The preferred alternative and alternative will be able to connect to the Ferrum - Umtu 132kv power line next to the site and both will require a short power line to be constructed.
Site access	A	A	• Access to the preferred alternative will be easily obtained from the R380 Provincial Road. • Access to the alternative site will be obtained via the existing farm roads.
Geology & soils	A	A	• Because soil conditions are fairly uniform across the site, there are no more and less suitable parts of the project area for development.
Landscape features	A	A	• Topography remains homogeneous throughout both sites with no obvious change in slope.

Visual impacts	B	A	• According to the Visual Impact Assessment (attached as Appendix H5) the proposed development is located in an area with relatively low significance in elevation. • Motorists on the R380 regional road are likely to be sensitive, especially if the preferred site is chosen, since there are little to no screening of visual impacts from the road. The alternative site is located 2,7km west from the R380 with some existing screening.
Agricultural potential	A	A	• The site has climate limitations, as well as soil limitations, making it unsuitable for cultivation and the land is solely used for cattle grazing. The land capability is classified as Class 7 -non-arable, low potential grazing land.
Cultural & heritage features	B	Unknown	• A small informal burial place was found on the preferred site. It is recommended that the burial site is retained and it should be permanently fenced off. • The alternative site was not assessed by the specialist; therefore, no comparison may be drawn.
Vegetation	B	B	• Habitat characteristics are comparable between both the preferred and alternative site.
Water features	A	B	• A number of non-perennial pans were observed in the area and some drainage lines were also recorded on the alternative site. • No pans were recorded directly on the preferred site and only one on the alternative site.
Biodiversity	A	A	• The biodiversity characteristics are comparable between both the preferred and alternative site.

Avifaunal	B	B	• The avifaunal study concluded that few differences existed in small bird numbers with respect to the preferred vs the alternative proposed PV site. • No collision-prone birds were recorded on either site, but two species (Martial Eagle and Pale Chanting Goshawk) may hunt within them at times.
Overall RATING	**A**	**B**	

5.5 CONCLUDING STATEMENT ON ALTERNATIVES

When considering the information provided by the specialists with regards to the site selection criteria and the comparison presented in table 5.4, the preferred site has still emerged as preferred due to the fact that potentially less impacts on water features.

In conclusion the preferred alternative entails the development of the 115MW Photovoltaic Solar Energy facility on the following location on the Remaining Extent of Portion 1 of the farm Limebank No. 471.

The preferred layout on the Remaining Extent of Portion 1 of the farm Limebank No. 471 is included as part of the Environmental Impact Report (EIR). It may be concluded that this is the only location that was assessed in further detail.

6 DESCRIPTION OF THE IMPACTS AND RISKS

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

Appendix 3. (3)(h) An EIR (...) must include-

(h) a full description of the process followed to reach the proposed development footprint, within the approved site, including –

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

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

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

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

(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-

(i) a description of all environmental issues and risks that were identified during the EIA process; and

(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.

(j) an assessment of each identified potentially significant impact and risk, including-

(i) cumulative impacts;

(ii) the nature, significance and consequences of the impact and risk;

(iii) the extent and duration of the impact and risk;

(iv) the probability of the impact and risk occurring;

(v) the degree to which the impact and risk can be reversed;

(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and

(vii) the degree to which the impact and risk can be mitigated;

(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;

6.1 SCOPING METHODOLOGY

The contents and methodology of the scoping report aimed to provide, as far as possible, a user-friendly analysis of information to allow for easy interpretation.

- Checklist (see section 6.1.1): 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 6.1.2): 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 that have been conducted to address the potentially most significant impacts.

6.1.1 Checklist analysis

The independent consultant conducted a site visit on 28 February 2016. The site visit was conducted to ensure a proper analysis of the site specific characteristics of the study area. Table 6.1 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 6.2.

Table 6.1: Environmental checklist

QUESTION	YES	NO	Un-sure	Description
1. Are any of the following located on the site earmarked for the development?				
I. A river, stream, dam or wetland		×		None.
II. A conservation or open space area		×		None.
III. An area that is of cultural importance	×			A small informal burial place was found on the preferred site.
IV. Site of geological significance		×		None.
V. Areas of outstanding natural beauty		×		None.
VI. Highly productive agricultural land		×		None.
VII. Floodplain		×		None.
VIII. Indigenous forest		×		None.
IX. Grass land		×		None.
X. Bird nesting sites		×		None.

XI. Red data species	×			*Acacia erioloba, and* Crinum c.f. macowanii listed by Raimondo et al (2009) in the South African Red Data list as Declining species were recorded on the site.
XII. Tourist resort		×		None.
2. Will the project potentially result in potential?				
I. Removal of people		×		None.
II. Visual Impacts	×			The VIA (refer to Annexure H5) confirmed that the visual impact of a low-lying PV facility is not expected to be significant.
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		×		Access will be obtained via the R380.
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 400 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 880m³ per annum.
VIII. Job creation	×			Approximately 453 employment opportunities will be created during the construction and operational phases.
IX. Traffic generation	×			It is estimated that 64 trips per day will be generated over the

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.
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	✕			Several non-perennial pans and some streams are located in the surrounding area.
II. A conservation or open space area		✕		None.
III. An area that is of cultural importance	✕			A number of stone tools and a small informal burial place were identified outside the preferred site.
IV. A site of geological significance		✕		None.
V. An area of outstanding natural beauty		✕		None.
VI. Highly productive agricultural land		✕		None.
VII. A tourist resort		✕		None.
VIII. A formal or informal settlement		✕		None.

6.1.2 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 possible mitigation measures. The matrix also highlights areas of particular concern (see Table 6.2) for more in depth assessment. An indication is provided of the specialist studies which were conducted and that informed the initial assessment. 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.

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.

Please refer to **Annexure G** for a more in-depth assessment of the potential environmental impacts.

Table 6.2: Matrix analysis

For ease of reference the significance of the impacts is colour-coded as follow:

Low significance	Medium significance	High significance	Positive impact

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 / consequence	Minor	Major	Extent	Duration	Probability	Reversibility	Irreplaceable loss of resources	Possible Mitigation	Possible mitigation measures	Level of residual risk	
CONSTRUCTION PHASE															
<u>Activity 11(i) (Regulation 983)</u>: *"The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* <u>Activity 28(ii) (Regulation 983):</u> *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* <u>Activity 1 (Regulation 984):</u> *"The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."*	<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. <u>Civil works</u> The main civil works are: • Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat. • 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. • Construction of access and inside roads/paths – existing paths will be used were reasonably possible. Additionally, the turning	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Loss or fragmentation of indigenous natural vegetation. • Loss of sensitive species. • Loss or fragmentation of habitats.		-	P	L	D	I	M	Yes	- Site clearing must take place in a phased manner, as and when required. - 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. - No trapping or snaring to fauna on the construction site should be allowed.	L	Ecological Fauna and Flora Habitat Survey & Avifaunal Study
			Avifauna	• Collision with PV itself from birds perceiving the panels as open water • disturbance by construction and maintenance activities • displacement through habitat removal and construction work • direct collision with the power line network.			L	L	Pr	PR	ML	Yes	- Bird scaring techniques including rotating prisms and experimental use of Torri lines are used if birds are found to impact the PV panels; - -The solar panels are constructed as far as possible from water points that could attract any wetland species;	L	Avifaunal Study

Activity 15 (Regulation 984): *"The clearance of an area of 20 hectare or more of indigenous vegetation..."*	circle for trucks will also be taken into consideration. • 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. <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. <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 electricity (AC) at grid frequency.												- All power lines – *present and future* – must be marked with bird diverters to reduce the possible impact risk for the bustards and raptorial species.		
			Air	• Air pollution due to the increase of traffic of construction vehicles.	-		S	S	D	CR	NL	Yes	- 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.	L	-
			Soil	• Loss of topsoil in disturbed areas, causing a decline in soil fertility. • Soil Erosion caused by alteration of the surface characteristics.		-	S	S	Pr	PR	M	Yes	- Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. - The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. - Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc.	M	Agricultural and Soils Impact Assessment
			Geology	• Collapsible soil. • Seepage • Active soil (high soil heave). • Erodible soil. • Hard/compact geology. If the bedrock occurs close to surface it may present problems when driving solar panel columns. • The presence of undermined		-	S	S	Pr	CR	NL	Yes	- The most effective mitigation will be the minimisation of the project footprint by using the existing roads in the area and not create new roads to prevent other areas also getting compacted. - If an activity will	L	Geotechnical Study

				ground. • Instability due to soluble rock. • Steep slopes or areas of unstable natural slopes. • Areas subject to seismic activity. • Areas subject to flooding.								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. - Retention of vegetation where possible to avoid soil erosion.		
			Existing services infrastructure	• Generation of waste that needs to be accommodated at a licensed landfill site. • Generation of sewage that needs to be accommodated by the local sewage plant. • Increase in construction vehicles on existing roads.		-	L	S	D	PR	ML	Yes	-	L	Confirmation from the Local Municipality
			Ground water	• Pollution due to construction vehicles.	-		S	S	Pr	CR	ML	Yes	- A groundwater monitoring programme (quality and groundwater levels) should be designed and installed for the site. Monitoring boreholes should be securely capped, and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside of the casing. Full construction details of monitoring boreholes must be recorded when they are drilled (e.g. screen and casing lengths, diameters, total depth, etc). Sampling of monitoring boreholes should be done according to recognised standards.	L	-

			Surface water	• Increase in storm water run-off. • Pollution of water sources due to soil erosion. • Destruction of watercourses • Degradation and/or destruction of natural pans.		-	L	S	Pr	PR	ML	Yes	- Silt fences should be used to prevent any soil entering the stormwater drains - New stormwater construction must be developed strictly according to specifications from engineers in order to ensure efficiency. - Any hazardous substances must be stored at least 200m from any of the water bodies on site.	M	Wetland Assessment
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	• Job creation. • Business opportunities. • Skills development.		+	P	S	D	I	N/A	Yes	- Where reasonable and practical, Boitshoko's service providers should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.	L	Social Impact Assessment
			Visual landscape	• Potential visual impact on residents of farmsteads and surrounding informal settlements and motorists in close proximity to proposed facility.	-		L	S	D	CR	NL	Yes	-	L	Visual Impact Assessment
			Traffic volumes	• Increase in construction vehicles.	-		P	S	Pr	CR	NL	Yes	The development may commence without influencing the levels-of-service for the local road network. However, some remedial work is recommended on the gravel road leading to the site. Remedial work on the road network should	L	Traffic Impact Assessment

													take place before the construction phase starts.		
			Health & Safety	• Air/dust pollution. • Road safety. • Impacts associated with the presence of construction workers on site and in the area. • Influx of job seekers to the area. • Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site. • Increased risk of veld fires.		-	L	S	Pr	PR	ML	Yes	- 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. - 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 the mitigation measures listed in the Social Impact Assessment (attached as Appendix H9).	M	Social Impact Assessment
			Noise levels	• The generation of noise as a result of construction vehicles, the use of machinery such as drills and people working on the site.	-		L	S	D	CR	NL	Yes	- During construction care should be taken to ensure that noise from construction vehicles and plant equipment does not intrude on the surrounding residential areas. Plant equipment such as generators, compressors, concrete mixers as well as vehicles should be kept in good operating order and where appropriate have effective exhaust mufflers.	L	-
			Tourism industry	• Since there are no tourism facilities in close proximity to the site, the proposed activities will not have an impact on tourism in	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

				the area.											
			Heritage resources	• No potential cultural or heritage resources were identified on or around the site.		-	S	S	Po	I	ML	Yes	- Any discovered artifacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the SAHRA should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered.	L	Heritage Impact Assessment & Palaeontological Heritage Assessment
OPERATIONAL PHASE															
	The key components of the proposed project are described below: • <u>PV Panel Array</u> - To produce 115MW, 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. • <u>Wiring to Central Inverters</u> - Sections of the PV array will be wired to central inverters. The inverter is a pulse width mode inverter that converts direct	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Loss or fragmentation of habitat for faunal and floral species. • Loss of indigenous faunal and floral species diversity. • Loss of faunal and floral species of conservation significance. • Loss or fragmentation of habitats. • Degradation and/or destruction of natural pans.		-	P	L	Po	PR	ML	Yes	- Indigenous vegetation must be maintained and all as removed as they appear and disposed of appropriately. - Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. - Implement an Avifauna Monitoring plan. - Also refer to the mitigation measures listed in the Ecological Fauna and Flora Habitat Survey & Avifaunal Study.	M	Ecological Fauna and Flora Habitat Survey & Avifaunal Study
			Air quality	• The proposed development will not result in any air pollution during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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 Boitshoko Solar Power Plant has not yet received a cost estimate letter from Eskom, it is expected that generation from the facility will tie in with the Ferrum -Umtu 132kv power line. The Project will inject up to 100MW into the Substation. The installed capacity will be up to approximately 115MW. • Supporting Infrastructure – Auxiliary buildings with basic services such as		Soil	• 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 • Impacts on agricultural potential (soil).		-	L	L	D	PR	SL	Yes	- An effective system of run-off control should be implemented, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. - Another important measure is to avoid stripping land surfaces of existing vegetation by only allowing vehicles to travel on existing roads and not create new roads. - Also refer to the mitigation measures listed in the Agricultural and Soils Impact Assessment (attached as Appendix H6).	M	Agricultural and Soils Impact Assessment
			Geology	• Collapsible soil. • Seepage (shallow water table). • Active soil (high soil heave). • Erodible soil. • Hard/compact geology. If the bedrock occurs close to surface it may present problems when driving solar panel columns. • The presence of undermined ground. • Instability due to soluble rock. • Steep slopes or areas of unstable natural slopes. • Areas subject to seismic activity. • Areas subject to flooding.		-	S	S	Po	PR	ML	Yes	- Surface drainage should be provided to prevent water ponding. - Mitigation measures proposed by the detailed engineering geological investigation should be implemented.	L	Geotechnical Study
			Existing services infrastructure	• Generation of waste that need to be accommodated at a licensed landfill site. • Generation of sewage that need		-	P	L	D	I	ML	Yes	- Waste has to be accommodated at a licensed landfill site.	M	Confirmation from the Local Municipality

	water and electricity will be constructed on the site and will have an approximate footprint 820m². Other supporting infrastructure includes voltage and current regulators and protection circuitry. • Roads – Access will be obtained via the R380 Provincial Road. 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 5-6m. • Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.			to be accommodated by the municipal sewerage system and the local sewage plant. • Increased consumption of water. Approximately 3 000 000 liters of water per annum will be required for the operation of the solar plant.								- Water saving devices will be implemented		
			Ground water	• 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.	-		L	L	Po	PR	ML	Yes	- All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should be securely bunded (impermeable floor and sides) to prevent accidental discharge to groundwater.	L	-
			Surface water	• 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. • 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. • Destruction of watercourses (non-perennial pans)		-	L	L	Pr	PR	ML	Yes	- The storm water management plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	L	Wetland Assessment
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	• 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. • Skills development.		+	L	L	D	I	N/A	Yes	- Where reasonable and practical, Boitshoko's service providers should implement a 'locals first' policy, especially for semi and low-skilled job categories	N/A	Social Impact Assessment
			Visual landscape	• Change in land-use/sense of		-	L	L	D	PR	ML	Yes	- Screening should be	M	Visual Impact

				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. • Potential visual impact on residents of farmsteads and travellers in close proximity to proposed facility.									implemented by means of vegetation in conjunction with security fencing. - 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 on the dirt road from being blinded by lights at the approach to the site.		Assessment
			Traffic volumes	• The proposed development will not result in any traffic impacts during the operational phase.	-		L	L	Po	CR	NL	Yes	-	L	Traffic Impact Assessment
			Health & Safety	• The proposed development will not result in any health and safety impacts during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Noise levels	• The proposed development will not result in any noise pollution during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Tourism industry	• 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.	+		P	L	Po	I	N/A	Yes	-	N/A	-
			Heritage resources	• It is not foreseen that the proposed activity will impact on heritage resources or vice versa.	-		S	L	Po	PR	ML	Yes	-	L	-
			Electricity supply	• Generation of additional electricity. The facility will generate electricity that will be	+		I	L	D	I	N/A	Yes	-	N/A	-

				fed into the grid.											
			Local community	• The establishment of a Community Trust.		+	L	L	Pr	I	N/A	Yes	- Boitshoko, in consultation with the GLM, should investigate the options for the establishment of a Community Development Trust.	N/A	Social Impact Assessment
			Electrical infrastructure	• 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.	+		I	L	D	I	N/A	Yes	-	N/A	-
DECOMMISSIONING PHASE															
-	<u>Dismantling of infrastructure</u> During the decommissioning phase the Solar PV Energy facility and its associated infrastructure will be dismantled. <u>Rehabilitation of biophysical environment</u> The biophysical environment will be rehabilitated.	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Re-vegetation of exposed soil surfaces to ensure no erosion in these areas.	+		S	L	Po	N/A	N/A	Yes	- Re-vegetation of affected areas must be made a priority to avoid erosion.	N/A	-
			Air quality	• Air pollution due to the increase of traffic of construction vehicles.	-		S	S	D	CR	NL	Yes	- Regular maintenance of equipment to ensure reduced exhaust emissions.	L	-
			Soil	• Soil degradation, including erosion. • Disturbance of soils and existing land use (soil compaction). • Physical and chemical degradation of the soils by construction vehicles (hydrocarbon spills).		-	S	S	Pr	PR	M	Yes	- Re-vegetation of affected areas must be made a priority to avoid erosion. - Mitigation measures for the construction phase will apply	M	Agricultural and Soils Impact Assessment
			Geology	• It is not foreseen that the decommissioning phase will impact on the geology of the site or vice versa.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Existing services infrastructure	• Generation of waste that need to be accommodated at a licensed landfill site. • Generation of sewage that need to be accommodated by the		-	L	S	D	I	NL	Yes	-	L	-

				municipal sewerage system and the local sewage plant. • Increase in construction vehicles.											
			Ground water	• Pollution due to construction vehicles.	-		S	S	Pr	CR	ML	Yes	-	L	-
			Surface water	• Increase in storm water run-off. • Pollution of water sources due to soil erosion. • Destruction of watercourses		-	L	S	Pr	PR	ML	Yes	- Removal of any historically contaminated soil as hazardous waste. - Removal of hydrocarbons and other hazardous substances by a suitable contractor to reduce contamination risks. - Removal of all substances which can result in groundwater (or surface water) contamination.	M	Wetland Assessment
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	• Loss of employment.		-	L	L	Po	PR	NL	Yes	- Boitshoko should ensure that retrenchment packages are provided for all staff retrenched when the facility is decommissioned.	M	Social Impact Assessment
			Visual landscape	• Potential visual impact on visual receptors in close proximity to proposed facility.	-		L	S	D	CR	NL	Yes	- Locate laydown and storage areas in zones of low visibility i.e. behind tall trees or in lower lying areas.	L	Visual Impact Assessment
			Traffic volumes	• Increase in construction vehicles.	-		L	S	Pr	CR	NL	Yes	- Movement of heavy construction vehicles through residential areas should be timed to avoid peak morning and evening traffic periods. In addition, movement of heavy construction	L	Traffic Impact Assessment

													vehicles through residential areas should not take place over weekends.		
			Health & Safety	• Air/dust pollution. • Road safety. • 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.	-		L	S	Pr	PR	ML	Yes	- Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. - Where dust is generated by trucks passing on gravel roads, dust mitigation to be enforced. - Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community.	L	-
			Noise levels	• The generation of noise as a result of construction vehicles, the use of machinery and people working on the site.	-		L	S	D	CR	NL	Yes	- The decommissioning phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of dwellings in close proximity to the development.	L	-
			Tourism industry	• Since there are no tourism facilities in close proximity to the	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

				site, the decommissioning activities will not have an impact on tourism in the area.											
			Heritage resources	• It is not foreseen that the decommissioning phase will impact on any heritage resources.		-	S	S	Pr	PR	ML	Yes	-	L	Heritage & Palaeontological Impact Assessment

Nature of the impact:	(N/A) No impact	(+) Positive Impact	(-) Negative Impact	
Geographical extent:	(S) Site;	(L) Local/District;	(P) Province/Region;	(I) International and National
Probability:	(U) Unlikely;	(Po) Possible;	(Pr) Probable;	(D) Definite
Duration:	(S) Short Term;	(M) Medium Term;	(L) Long Term;	(P) Permanent
Intensity / Magnitude:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High
Reversibility:	(CR) Completely Reversible;	(PR) Partly Reversible;	(BR) Barely Reversible;	-
Irreplaceable loss of resources:	(IR) Irreversible	(NL) No Loss;	(ML) Marginal Loss;	(SL) Significant Loss;	(CL) Complete Loss
Level of residual risk:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	-

An Environmental Awareness and Fire Management Plan is included in Appendix I as part of the EMPr

6.2 KEY ISSUES IDENTIFIED

From the above it is evident that mitigation measures should be available for potential impacts associated with the proposed activity and development phases. The scoping methodology identified the following key issues which were addressed in more detail in the EIA report.

6.2.1 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 11(i) (Regulation 983): *"The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 28(ii) (Regulation 983): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 1 (Regulation 984): *"The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."*
- Activity 15 (Regulation 984): *"The clearance of an area of 20 hectare or more of indigenous vegetation..."*

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, soils, geology, surface water (non-perennial pans), existing services infrastructure, socio-economic impacts such as the provision of temporary employment and other economic benefits, and the impacts on health and safety and heritage resources.

6.2.2 Impacts during the operational phase

During the operational phase the study area will serve as a solar plant. The potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with impacts on the fauna and flora, soils, geology, surface water (non-perennial pans), the pressure on existing services infrastructure, 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.

6.2.3 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 however potentially result in impact on soils, pressure on existing service infrastructure, surface water and the loss of

permanent employment. Skilled staff will be eminently employable and a number of temporary jobs will also be created in the process. Decommissioning of a PV facility will leave a positive impact on the habitat and biodiversity in the area as the area will be rehabilitated to its natural state.

6.3 ASPECTS TO BE ASSESSED

Table 6.3 below provides a summary of the aspects that need to be assessed as part of the EIR. The aspects are also linked to specialist information that has been obtained. Refer to Table 6.2 for a description of the potential impacts.

Table 6.3: Aspects to be assessed

Aspects	**Potential impacts**	**Specialist studies / technical information**
Construction of the PV Solar facility	• Impacts on agricultural potential (soils)	Soil, Land Capability and Agricultural Potential Study
	• Impacts associated with the geology of the site	Geotechnical study
	• Impacts on existing services infrastructure	Confirmation from the Local Municipality
	• Impacts on surface water	Wetland assessment
	• Temporary employment, impacts on health and safety	Social Impact Assessment
	• Impacts on heritage resources	Heritage Impact Assessment & Palaeontological Heritage Assessment
	• Impacts on Traffic	Traffic Impact Study
	• Socio-economic impacts	Social Impact Assessment
Operation of the PV Solar facility	• Impacts on the fauna and flora	Ecological Fauna and Flora Habitat Survey & Avifauna study
	• Impacts on agricultural potential (soils)	Soil, Land Capability and Agricultural Potential Study
	• Impacts associated with the	Geotechnical study

	geology of the site	
	• Increased consumption of water	EAP assessment
	• Impacts on surface water	Wetland assessment
	• Pressure on existing services infrastructure	Confirmation from the Local Municipality
	• Visual Impact	Visual Impact Assessment
	• Provision of employment & generation of income for the local community	Social Impact Assessment
Decommissioning of the PV Solar facility	• Impacts on agricultural potential (soil)	Soil, Land Capability and Agricultural Potential Study
	• Impacts on surface water	Wetland assessment
	• Impacts on heritage resources	Heritage Impact Assessment & Palaeontological Heritage Assessment
	• Socio-economic impacts (loss of employment)	Social Impact Assessment
Cumulative Impacts	• Cumulative biophysical impacts resulting from similar developments in close proximity to the proposed activity.	EAP assessment & Specialist Assessment (All specialists)

6.4 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 Geotechnical Assessment – conducted by Johann Lanz (see Appendix H1).
- Ecological Habitat Fauna and Flora Study – Environmental Research Consulting (see Appendix H2).
- Wetland Assessment - Environmental Research Consulting (see Appendix H3).

- Avifaunal Study – Birds & Bats Unlimited (see Appendix H4).
- A Visual impact assessment - conducted by Phala Environmental Consultants (Pty) Ltd. (see Appendix H5).
- Agricultural and Soils Assessment – conducted by Johann Lanz (see Appendix H6).
- A Heritage Impact Assessment - conducted by Mr. J.A. van Schalkwyk (see Appendix H7).
- Paleontological Study – conducted by Dr. Lloyd Rossouw (see Appendix H8).
- Social Impact Assessment - conducted by Leandri Kruger (see Appendix H8).
- Traffic Study – conducted by BVi Consulting Engineers (see Appendix H9).
- A detailed assessment of the cumulative impacts associated with the proposed development – conducted by the lead consultant, Environamics in conjunction with the project specialists (refer to Section 7 of this report and Appendix L).

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

6.4.1 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 favourable for the development of a PV solar plant?"*

According to the Geotechnical Study (Appendix H1) the entire site is probably underlain by shallow, hardpan carbonate that varies between 0 and 40cm below surface. It is likely to vary in thickness between about 20 and 80cm. There is a thin covering (0-40cm) of unconsolidated, sandy soil above the hardpan. The foundations for mounting structures will need to be erected through the hardpan carbonate layer.

None of the following occur on the site:

- Shallow water table (less than 1.5m deep)
- Sinkhole or doline areas.
- Seasonally wet soils (often close to water bodies)
- Unstable rocky slopes or steep slopes with loose soil
- Dispersive soils (soils that dissolve in water)
- Soils with high clay content (clay fraction more than 40%)

- Any other unstable soil or geological feature

Soils across the site are susceptible to wind erosion. The geotechnical conditions are assessed, in terms of this investigation, as suitable for the development of a solar energy facility. Because soil conditions are fairly uniform across the site, there are no more and less suitable parts of the project area for development, but drainage areas between wetlands should be avoided.

6.4.2 Issue 2: Heritage and archaeological 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 archaeological artefacts?"*

The Heritage Impact Assessment (Refer to Appendix H7) confirmed the following:

The aim of this survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the areas of the proposed development, to assess the significance thereof and to consider alternatives and plans for the mitigation of any adverse impacts. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age) occupation and a much later colonial (farmer) component. The second component is an urban one consisting of a number of smaller towns, most of which developed during the last 150 years or less.

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development. A number of stone tools dating to the Fauresmith assemblage and Middle Stone Age were identified on the rim of a small pan-like depression occurring adjacent to the old farmstead. The density is approximately 1 stone tool/5m^2. This feature is viewed to have low significance on a local level and based on current understanding of the proposed development, this site is located outside the development area and would not be impacted by the solar plant development. Therefore, no further action is required.

A single informal burial site with at least five graves was identified. As it is located inside the study area it is anticipated that it eventually would be impacted on by the solar plant development. This feature is viewed to have high significance on a local level. If at all possible, the burial site should be avoided and fenced off with wire, leaving a buffer zone of at least five metres from the outer edges of the graves. If the area cannot be avoided, it is recommended that graves are relocated after the proper procedure has been followed.

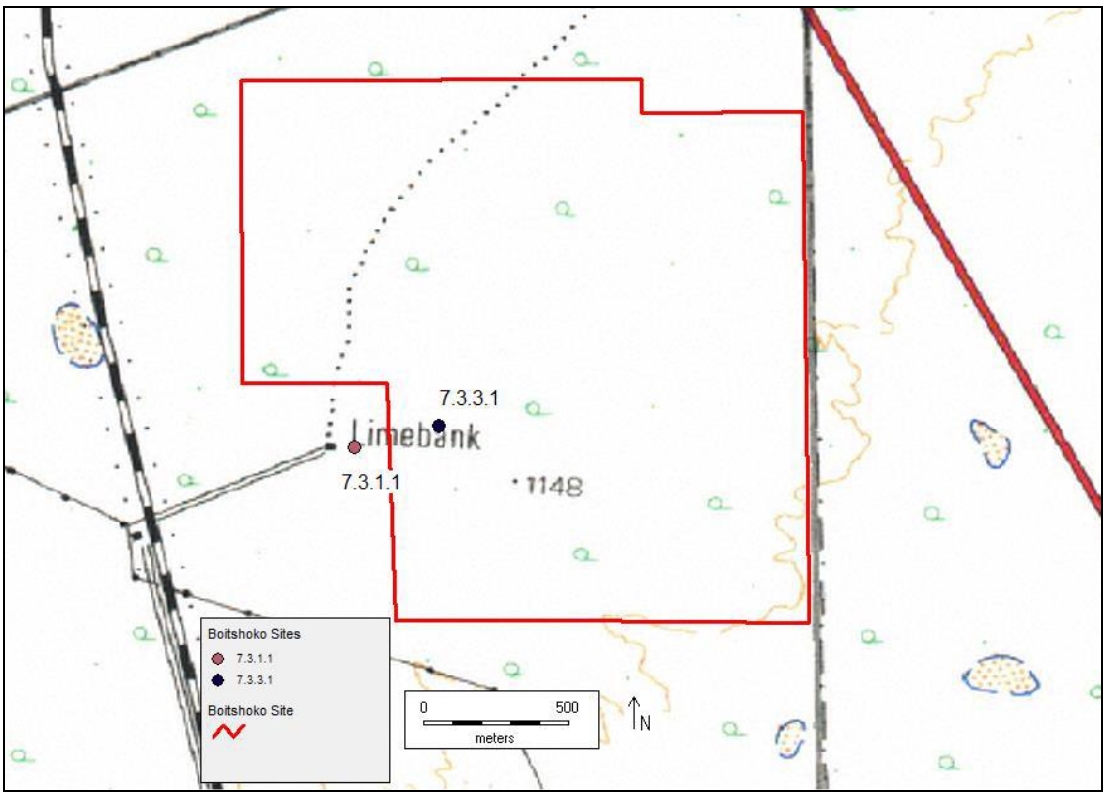


Figure 20: Location of the identified sites

From a heritage point of view, it is recommended that the proposed development be allowed to continue.

6.4.3 Issue 3: Ecological Impacts

The potential impact of the proposed development on threatened flora and fauna known to occur in the Northern Cape 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 H2) confirmed that: The low faunal and moderately high floristic species richness and density recorded would equate to a low impact to the regional diversity of plants, mammals, reptiles and amphibians. Although the number of protected faunal species possibly occurring on or in close proximity to the site is low, these deserve consideration. It must be stressed that the short study period may affect the generation of a representative sample (see also 'Assumptions and Limitations'). We are nonetheless confident in the sampling methods employed as the methodology was designed with the study limitations in mind.

The loss of topsoil and fragmentation of natural habitats that is virtually unavoidable with any type of development, has a negative impact on the regional ecosystem as it disrupts the natural flow of ecosystem services and affects all fauna and flora that are dependent on those habitats. Linear ridges, water courses, wetlands, drainage lines, etc. are especially sensitive to and easily fragmented. A high conservation value is attributed to the plant communities and faunal assemblages of these areas as they contribute significantly to the

biodiversity of a region. Care should be taken not to unnecessarily clear or destroy natural vegetation and where possible the rehabilitation of transformed areas and restoration of degraded natural veld should take place in order to improve the ecological health of the floristic component on the property. Development should therefore be planned in such a way that totally transformed areas are chosen for major developments and natural veld, even if it is already degraded and/or fragmented, is avoided as far as possible. A legitimate and well-designed rehabilitation plan must be set in place before mining commences and be strictly enforced on an on-going basis throughout the life of the mine and thereafter.

When considering the different sites (preferred and alternative sites) that were investigated during this study it is concluded that the preferred site may be accepted from a faunal, floral, wetland and general ecological point of view for the proposed development.

6.4.4 Issue 4: Avifaunal Impacts

The potential impact of the proposed development on birds known to occur in Northern Cape Province had to be determined. The main question which needs to be addressed is:

> *"How will the proposed development impact on the avifauna?"*

According to the Avifaunal Study (Appendix H3) concluded that: The avifauna of the area may be affected by the infrastructure of the Solar Power (PV) plant but our analysis of the number of birds on site suggests the impact will be minimal, based on two well-timed visits in the wet and dry (spring) seasons.

The study indicated that it is unknown whether the collision-prone birds that occur around the area, particularly the Endangered Martial Eagle, will be pulled into the site in the dry season (to hunt around the farm dams); or, once the PV panels are in place, whether wetland birds will be attracted to them. Too little research in South Africa is presently available to determine that, and thus, a full 12 months of post-construction monitoring by trained ornithologists is a strong recommendation.

The Avifaunal Study also recommended that all available precautions are taken to avoid the Endangered Martial Eagles and other more numerous birds such as sandgrouse being attracted to the panels. If birds are attracted to, and collide with, the panels by mistaking it for open water then we recommend that innovative bird deterrent techniques are used such as the Torri lines mentioned in the avian Scoping Report (Simmons and Martins 2016).

If these recommendations can be followed and prove effective, we believe that the Boitshoko PV solar park can be allowed to proceed with the least impact to the avifauna of the area, locally or cumulatively.

6.4.5 Issue 5: Visual Impacts

Due to the extent of the proposed photovoltaic solar plant 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 H5) concluded that the post mitigation impact is a "*Negative Low"* impact during the construction, decommissioning and operational phase. Most of the visual receptors are likely to be impacted by both the preferred and alternative sites due to close proximity but will not be sensitive due to the mines in the area, although, in general, the majority of people would prefer rural views over views of industrial development. The mines play an important role in the local economy and all residents of the area are used to living with a rather immense negative visual impact. The proposed development might not result in significant glare problems towards Sishen Airport, but the proposed development might be considered as "Objects Affecting Airspace" according to the South African Civil Aviation Authority.

In terms of possible landscape degradation, the landscape does appear to have existing screening up to a certain level. Camel thorn trees are abundant in the area and can be used for screening.

Taking into account all positive factors of such a development including economic factors, social factors and sustainability factors, the visual impact of this proposed development will be insignificant and is suggested that the development commence, from a visual impact point of view. Both the alternative and preferred sites have their own positive and negative impacts. The preferred site has a more visual negative impact on users of the R380 regional road than the preferred site taking into account the problem of dust generation that might have an impact on traffic as they pass the site, where the alternative site has a more negative impact on the natural environment and a more negative visual impact on the town of Deben due to close proximity of approximately 3,6km. It is recommended that development commence on the preferred site.

6.4.6 Issue 6: 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 a soil 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 H6) the proposed development is on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the investigated site is on land which is of low agricultural potential and is not suitable for cultivation.

Because of the low agricultural potential of the site, the development should, from an agricultural impact perspective, be authorised. It is preferable to incur a loss of agricultural land on such a site, without cultivation potential, then to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country. No

agriculturally sensitive areas occur within the proposed site and no part of it is therefore required to be set aside from the development.

Because the site is uniformly low potential, from an agricultural point of view, there is no preferred location or layout within the assessed site. There are no conditions resulting from this assessment that need to be included in the environmental authorisation.

6.4.7 Issue 7: 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 H8). 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 H9) indicate that during the construction and the operational phase of the proposed development project, various employment opportunities, with different levels of skills will be created.

In addition, this will also create local business opportunities benefitting the socio-economic development of the local community. The local community will however benefit from the establishment of a Community Trust if it is managed effectively.

The challenges posed by climate change and global warming will be addressed by the investment in renewable energy facilities like the proposed Solar Power Plant. The establishment of the proposed Solar Power Plant is supported by the findings of this report and therefore, also creating a positive social benefit for society. It is however recommended that the environmental authorities consider the potential visual impacts addressed in the Visual Impact Assessment (VIA) of this proposed project and impacts to the sense of place, regarding this proposed project.

6.4.8 Issue 9: Paleontological 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. The main question which needs to be addressed is:

"How will the proposed development impact on the Palaeontological resources?"

According to the Palaeontological Impact Assessment (Appendix H8) the proposed development footprint, including both the preferred and one alternative site is underlain by well-developed Kalahari Group surface limestones, calcretes and wind-blown sands of low to

moderate palaeontological sensitivity, but impact on palaeontological heritage resources is on the whole considered to be low, as no potentially palaeontologically significant karst features were identified within the boundaries of the Boitshoko SPP footprint and associated transmission line.

There are no areas within the preferred as well as the alternative site footprint that need to be avoided and no mitigation measures or further monitoring are required. Potential for cumulative impacts of this project on paleontological resources is considered to be low locally and regionally.

If, in the unlikely event that localized fossil material is discovered within the sandy overburden during the construction phase of the project, it is recommended that a professional palaeontologist be called to assess the importance and rescue the fossils if necessary. As far as the palaeontological heritage is concerned, the

6.4.9 Issue 10: Traffic Impacts

Large developments are normally associated with an increase in construction vehicle traffic. The main question which needs to be addressed is:

"How will the proposed development impact on the traffic on main delivery routes to the site?"

According to the Traffic Impact Assessment (Appendix H10) The impact of the construction traffic on the general traffic and the surrounding communities along the haulage route is considered to be low. All the components will be transported by truck from Cape Town or Durban to the site using the routes as defined. Both these routes are of acceptable standard and should not impede travel from a riding quality perspective. No abnormal loads will be transported to the site. The access to the site is off Provincial Route 380 which will trigger the involvement of the Provincial Government and their approval for the construction of a new access and adequate traffic accommodation signage must be erected and maintained on either side of the access on R380 throughout the construction period.

The development of a solar farm on Portion 1 of the farm Limebank 471 in the Northern Cape Province is therefore supported from a traffic engineering perspective.

6.5 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its 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 6.4.

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.

6.5.1 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 project phases:

- planning
- 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 6.4: The rating system

NATURE		
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.		
GEOGRAPHICAL EXTENT		
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.
PROBABILITY		
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).
DURATION		
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.
INTENSITY/ MAGNITUDE		
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.
REVERSIBILITY		
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.
IRREPLACEABLE LOSS OF RESOURCES		
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.

CUMULATIVE EFFECT		
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

SIGNIFICANCE		
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 positive effects.

7 CUMULATIVE EFFECTS ASSESSMENT

This section aims to address the requirements of Section 2 of the NEMA to consider cumulative impacts as part of any environmental assessment process.

Information Requirements as set out by the DEA with the acceptance of the Final Scoping Report

(xix) Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment must be refined to indicate the following:

- Assessment of cumulative impacts of all identified impacts.
- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impacts must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.
- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.

A cumulative impact environmental statement on whether the proposed development must proceed.

7.1 Introduction

The EIA Regulations (2014) determine that cumulative impacts, "in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities." 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 Scoping Report 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 – refer to Appendix G. This chapter analyses the proposed project's potential cumulative impacts in more detail by: (1) defining the geographic area considered for the cumulative effects analysis; (2) providing an overview of relevant past and present actions in the project vicinity that may affect cumulative impacts; (3) presenting the reasonably foreseeable actions in the geographic area of consideration; and (4) determining whether there are adverse cumulative effects associated with the resource areas analysed.

The term "Cumulative Effect" has for the purpose of this report been defined as: the summation of effects over time which can be attributed to the operation of the Project itself, and the overall effects on the ecosystem of the Project Area that can be attributed to the Project and other existing and planned future projects.

7.2 Geographic Area of Evaluation

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in this cumulative effects analysis generally includes an area of a 30km radius surrounding the proposed development – refer to figure 21 below.

Figure 21: Geographic area of evaluation with a 120km radius around the proposed development site

The geographic spread of PV solar projects, administrative boundaries and any environmental features (the nature of the landscape) were considered when determining the geographic area of investigation. It was argued that a radius of 30km would generally confine the potential for cumulative effects within this particular environmental landscape. The geographic area therefore only includes projects located within the Northern Cape Province. A larger geographic area may be used to analyse cumulative impacts based on a resource 's specific temporal or spatial impacts. For example, the socioeconomic cumulative analysis may include a larger area, as the construction workforce may draw from a much

wider area. The geographic area of analysis is specified in the discussion of the cumulative impacts for that resource where it differs from the general area of evaluation described above.

7.3 Temporal Boundary of Evaluation

A temporal boundary is the timeframe during which the cumulative effects are reasonably expected to occur. The temporal parameters for this cumulative effects analysis are the anticipated lifespan of the Proposed Project, beginning in 2019 and extending out at least 20 years, which is the minimum expected project life of the proposed project. Where appropriate, particular focus is on near-term cumulative impacts of overlapping construction schedules for proposed projects in the area of evaluation.

7.4 OTHER PROJECTS IN THE AREA

7.4.1 Existing projects in the area

According to the Energy Blog's database four solar PV plants have been granted preferred bidders status within the geographic area of investigation – refer to figure 22 below. Two of the plants are fully operational:

- Adams Solar PV2 with a capacity of 82.5MW near Hotazel, Northern Cape Province (Awaiting construction – approved and financed).
- Kathu Solar Energy Facility with a capacity of 75MW near Kathu, Northern Cape Province (Fully operational).
- Sishen Solar Facility with a capacity of 74MW near Kathu, Northern Cape Province (Fully operational).
- Kathu Solar Park (CSP) with a capacity of 100MW near Kathu, Northern Cape Province (Awaiting construction – approved and financed).

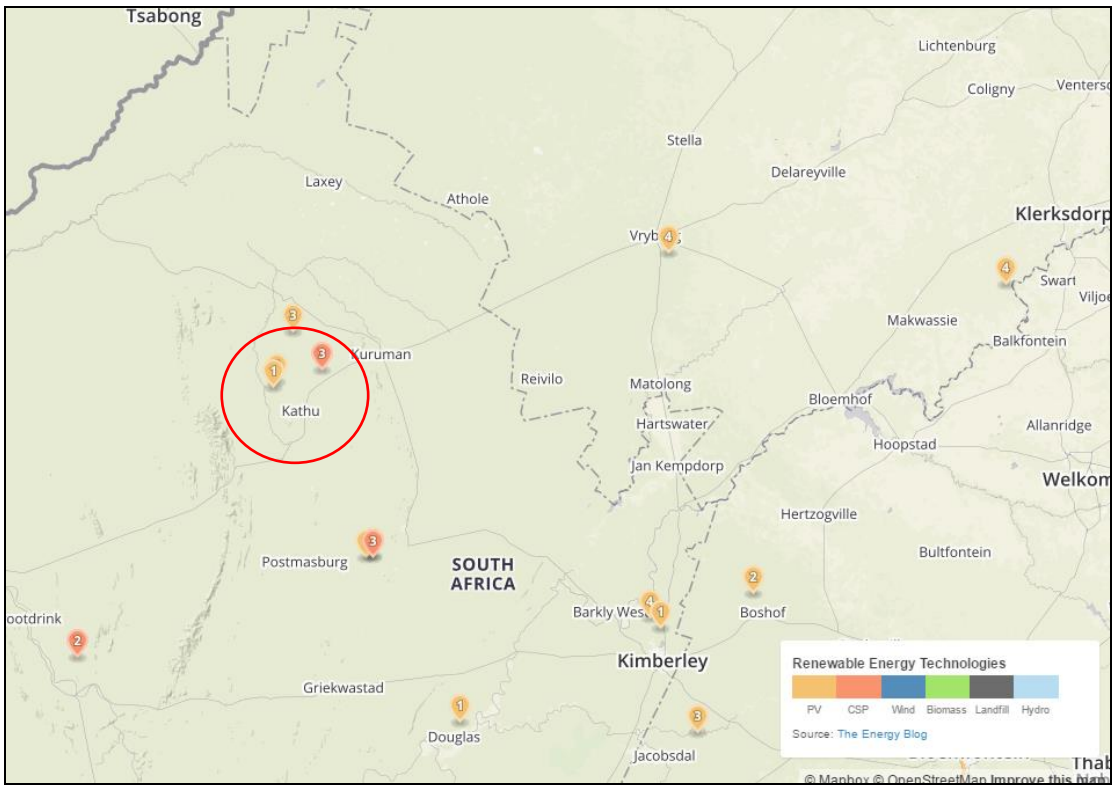


Figure 22: Utility-scale renewable energy generation sites

It is unclear whether other projects not related to renewable energy is or has been constructed in this area. In general, development activity in the area is focused mining.

It is quite possible that future solar farm development may take place within the general area. The next section of this report will aim to evaluate the potential for solar projects for this area in the foreseeable future.

7.4.2 Projects in the foreseeable future

As part of the SEA for Wind and Solar Energy in South Africa, the CSIR and the DEA mapped the location of all EIA applications submitted within South Africa – refer to figure 23 below. According to this database approximately 8 applications have been submitted for renewable energy projects within the geographical area of investigation. Of the 8 applications 3 have been withdrawn or lapsed, four have been approved and 1 is preferred bidder. The other two PV plant from bid round 1 and 2 is not indicated on the database.

- San Solar Energy Facility
- Kalahari Solar Power Project
- Bestwood Solar Farm
- Adams Photo-Voltaic Solar Energy Facility
- Shirley
- Kathu Solar Energy Facility
- Sishen Solar Facility

Figure 23: National Wind and Solar PV SEA: Renewable Energy EIA Application Received before Dec. 2016

7.5 SPECIALIST INFORMATION ON CUMULATIVE EFFECTS

In line with the Terms of Reference (ToR) provided as part of the scoping report, specialists were asked to, where possible, take into consideration the cumulative effects associated with the proposed development and other projects which are either developed or in the process of being developed in the geographic area of investigation. The following sections present their findings.

Projects within the geographical area of investigation were identified and their specialist assessments were obtained by doing an internet search. Unfortunately not all the specialist information could be obtained. A PAIA request (Refer to Appendix K) was submitted to DEA to obtain the outstanding specialist. To date no additional studies have been obtained. For a list of the available specialist studies, please refer to Tabel 7.1 below:

Table 7.1: Specialist Assessments obtained

PROPOSED DEVELOPMENT	DEA REFERENCE NO.	CURRENT EIA STATUS	FARM DETAILS	Ecological	Avifaunal	Visual	Agri & Soil	Heritage	Palaeo	Social	Traffic
Boitshoko Solar Power Plant	14/12/16/3/3/2/935	EIA ongoing	Remaining Extent of Portion 1 of the farm Limebank No. 471	X	X	X	X	X	X	X	X
San Solar Energy Facility	14/12/16/3/3/2/273	Approved	The remaining extent of the farm Wincanton 472	X		X	X	X		X	
Kalahari Solar Power Project	12/12/20/1994/AM2	Approved	The Farm Kathu 465,					X		X	
Bestwood Solar Farm	12/12/20/1906	Approved	The remainder of the farm Bestwood 459					X			
Adams Photo-Voltaic Solar Energy Facility	12/12/20/2567	PB_R3	The Farm Adams 328					X			
Shirley	14/12/16/3/3/2/616	Approved	Portion 1 of the Farm Shirley No. 367, Kuruman RD					X			
Kathu Solar Energy Facility	-	Fully Operational	-								
Sishen Solar Facility	-	Fully Operational	-								

The project specialist was given access to the relevant specialist information and were required to assess the available reports by completing a table designed by Environamics. They were instructed to assess the cumulative effect of the projects in question by using the approved significance rating metodology and concluding with an impact statemnt on the significance of these potential cumulative impacts – refer figure 26 below for the process flow. The following sections present their findings. The detailed assessments conducted by the specialists are included as Addendums to their reports and the reviews of the specialist studies are included in Appendix L.

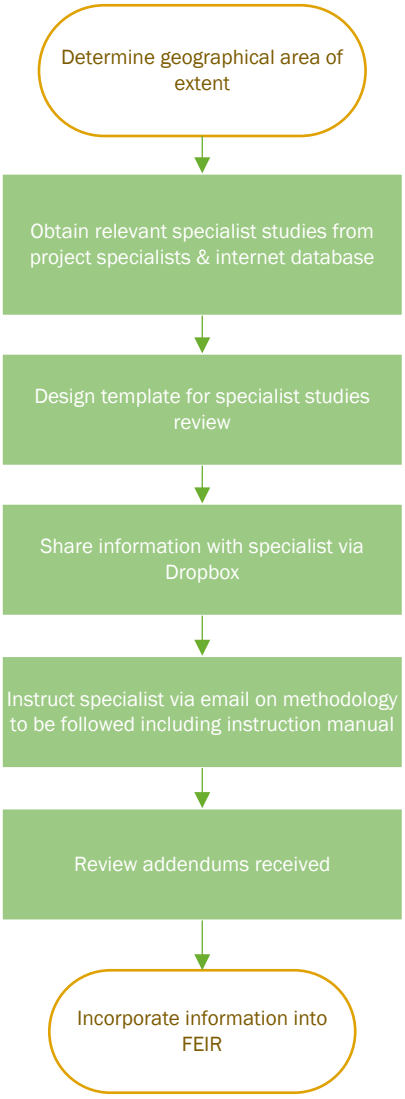


Figure 24: Process flow diagram for determining Cumulative Effects

7.5.1 Geology

The Geotechnical Study (refer to Appendix H1) confirmed that based on the available information a fatal flaw cannot be identified that may prematurely terminate the development of the proposed solar farm. According to the specialist the site should be regarded as suitable for the proposed development and no cumulative impacts are foreseen.

7.5.2 Soil, Land Capability and Agricultural Potential

The Agricultural and Soils Impact Assessment (refer to Appendix H6) confirmed that although the agricultural impact on individual project portions of land has low significance, as shown from all the specialist reports reviewed – refer to Appendix L, the cumulative impacts of loss of production potential becomes more significant regionally. The regional cumulative impact is assessed as having medium significance. However, despite this cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to regions such as this one, with low agricultural potential. It is preferable to incur a higher cumulative loss in such a region, than to lose agricultural land with a higher production potential elsewhere in the country.

7.5.3 Ecology

The Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) confirmed that the regional cumulative impact is assessed as having medium significance. The cumulative impact on individual portions of land of proposed or current project areas has low to medium significance, as derived from the specialist reports reviewed, however, the cumulative impacts of loss of biodiversity and habitat integrity potentially becomes more significant regionally as more and more similar projects arise. However, despite this cumulative impact, it may still be argued from a national biodiversity perspective, that more of the country's renewable energy developments should be planned in regions such as this one, where the average biodiversity per area is generally lower than others. In terms of the desirability of the development of sources of renewable energy therefore, it may be preferable to incur a higher cumulative loss in such a region as this one, than to lose land with a higher biodiversity potential and ecological value elsewhere in the country.

7.5.4 Birds

The Avifaunal Study's (refer to Appendix H3) crude estimates of their impact on the avifauna (based on fatality estimates from only one study of avian mortality at an operational PV site in the Northern Cape) suggest about 1870 birds may be killed annually. Thus, the cumulative impact is deemed to be low and requires little mitigation, but careful monitoring. The lack of data from these other sites is concerning and means there is low certainty in this result, because we do not understand how many sensitive red data species are likely to be killed.

7.5.5 Social Impact Assessment

According to the Social Impact Assessment (refer to Appendix H9) previous similar projects described that the potential cumulative impacts associated with wind farms can also be regarded as pertinent to SEFs. The relevant issues that need to be taken into consideration when it comes to the impacts on sense of place is, combined visibility (if two or more SEFs are visible from one location), sequential visibility (seeing two or more SEFs along a road or trail), the perceived or actual change in the land use across a region, loss of characteristic environment and element, and the visual compatibility of different SEFs in the same vicinity. It is further noted that cumulative impacts need to be considered in relation with dynamic

and static viewpoints. It is also important that aesthetic perception regarding the sense of place, are a key determinant of people's attitudes and is subjective of matter.

The potential social impact associated with the establishment of an SPP will have a visual impact on the environment and its surroundings, however, the impact on the sense of place is likely to be low. The proposed Boitshoko SPP might slightly be visible from the R380, but the impact hereof on the sense of place is likely to be low. In addition, the transmission lines to the substation is also linked to visual impact and the areas sense of place. However, the potential social impacts associated with the transmission lines will be low. There is also already an established SPP in the area, also contributing to the economy of the local community. The potential negative impact of the proposed development on the areas' sense of place still needs to be considered, because of South Africa's strong attachment to land and the number of SEFs increasing. A number of SEFs have been proposed in the province, thus environmental authorities need to take this into account for cumulative impacts when evaluating the applications. The Visual Impact Assessments (VIAs) of all applications also needs to be evaluated and considered in this regard.

In addition, hereto, the proposed Boitshoko SPP has the potential to result in significant positive cumulative impacts. The establishment of the proposed Boitshoko SPP and other SEFs in the Northern Cape Province will create a positive socio-economic contribution to the province and the local municipality, and in turn will create a positive social benefit. The positive cumulative impacts in the case of the Boitshoko SPP will include the creation of employment opportunities, training and skills development opportunities, downstream business opportunities and more movement will be made towards the use of renewable energies. For this reason, the proposed development should be supported.

7.5.6 Visual

The Visual Impact Assessment (refer to Appendix H5) confirmed the combined cumulative effect, post mitigation impact, is Low for the construction phase, Low for the operational phase and Low for the decommissioning phase. The pre mitigation impact for the construction phase is Medium, Medium for the operational phase and Low for the decommissioning phase. According to the scores mitigation measures will lower the impact further, still if all projects receives preferred bidder status, thus stating the importance of mitigation measures. At the time of this report it is still uncertain which of the projects near Kathu will receive preferred bidder status. The most significant visual impact will be that of dust generation, and as previously mentioned, dust suppression will play an important role. Construction plant will also add to a negative visual impact especially if all projects proceed at once. Traffic of such plant will increase in and around Kathu. The majority of the projects (4) fall within 17km of Kathu and Deben, thus increasing the visual impact due to close distance to a populated area.

Taking into account all positive factors of such developments including economic factors, social factors and sustainability factors, the cumulative impact of all the projects near Kathu will be Low, taking into account post mitigation, and is suggested that all developments commence, from a visual impact point of view.

7.5.7 Heritage

The Heritage Impact Assessment (Refer to Appendix H6) concluded that due to a number of similar development applications in the region, a cumulative impact assessment was compiled. This was done by reviewing available reports, considering the quantity and significance of the various known and identified sites and reviewing the proposed mitigation measures for each of these.

A review of the available information indicates that overall the heritage potential, with the exception of some exclusion zones such as hills and river regions, is very low.

According to Section 7 of the National Heritage Resources Act, Act no. 25 of 1999, all the sites identified for the various projects are classified as having Grade III significance, i.e., being described as "Other heritage resources worthy of conservation on a local authority level." No sites with a Grade I or Grade II significance have been identified.

An evaluation of the possible cumulative impacts from the combined solar power plant developments in the region on sites, features and objects of cultural heritage significance would be very low and is therefore seen as acceptable. Through the implementation of mitigation measures the impact, locally or cumulative, can be turned into a positive impact through the study of such sites, adding to local as well as regional knowledge. From a heritage point of view it is recommended that the proposed development be allowed to continue.

The Palaeontological Impact Assessment (Refer to Appendix H7) also confirmed that it is very difficult to realistically assess cumulative impacts on palaeontological heritage resources in the region, given the currently inadequate data on proposed infrastructure developments other than solar (i.e. mines, roads, township extensions) or which solar projects will eventually be constructed. However, given the overall assessment, the cumulative impact on palaeontological heritage resulting from these developments, would probably be low. No specialist palaeontological mitigation is considered necessary, but in the event of chance fossil finds during construction, the responsible Environmental Control Officer should safeguard these, preferably *in situ*. The South African Heritage Resources Authority (SAHRA) should also be alerted as soon as possible.

7.5.8 Traffic

The Traffic impact assessment indicated that the table below is a summary of the expected trips generated by the development of the solar power plants along with the background traffic on each of the major routes into Kathu. These volumes are for the immediate surrounding road network.

Table 7.2: Cumulative Trip Summary

Destinations	On N14	On R380
Current ADT on Route (vpd)	5 512	532
Delivery & Construction Trips (vpd)	192	192
Commuter Trips (vpd)	360	360
Total Expected Trips	**6 064**	**1 084**

The projected trips per day for the scenario that includes six solar developments, are deemed to be of no consequence to the LOS of the travelled route from Cape Town to Kathu or Durban to Kathu as it does not exceed or even approach the maximum AADT of 8 800 vpd. From table 7.2 above it is therefore apparent that the cumulative additional trips will not impact greatly on the immediate or wider road network. It must be noted that the traffic volumes were low to begin with and therefore the significance of the impact experienced by the normal road users is considered little in comparison to the current LOS.

7.6 IMPACT ASSESSMENT

Following the definitions of the term, the "residual effects on the environment", i.e. effects after mitigation measures have been put in place, combined with the environmental effects of past, present and future projects and activities will be considered in this assessment. Also, a "combination of different individual environmental effects of the project acting on the same environmental component" can result in cumulative effects.

7.6.1 Potential Cumulative Effects

The receptors (hereafter referred to as Valued Ecosystem Components (VECs) presented in Section 6 (refer to the matrix analysis) have been examined alongside other past, present and future projects for potential adverse cumulative effects. A summary of the cumulative effects discussed are summarized in Table 7.3 Specific VECs were identified with reference to the Solar Project (Table 6.2), which relates to the biophysical and socio-economic environments. Table 7.3 indicates the potential cumulative effects VECs and the rationale for inclusion/exclusion.

Table 7.3: Potential Cumulative Effects for the proposed project

Valued Ecosystem Components (VECs)	**Rationale for Inclusion / Exclusion**	**Level of Cumulative Effect**
Construction Phase		
Loss or fragmentation of indigenous natural fauna and flora	The loss of habitat on-site has the potential to add to the cumulative impacts that habitat loss in the region is having on avifauna. Other projects will also constitute the removal of more protected tree species as the ones on site and may have a regional detrimental impact.	- Medium
Avifauna	Development of multiple solar energy facilities in this region may have cumulative impacts on birds, this will happen via the same factors identified	- Medium

	here viz: collision, avoidance and displacement.	
Loss or fragmentation of habitats	The developments are located in an area with numerous protected plant and tree species as well as Red Data Bird species. Removal of large areas of these habitats may have a detrimental effect on loss of habitats.	- Medium
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 could cause erosion. Should these impacts occur, there may be a cumulative impact on storm water runoff in the study area. The specialist rated the cumulative impact of soil erosion as negligible.	- Low
Impacts of the geology on the proposed development	A fatal flaw cannot be identified that may prematurely terminate the development of the proposed solar farm.	N/A
Generation of waste	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.	- Medium
Employment opportunities	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.	+ Medium
Visual intrusion	The construction of the PV plant and 132kV evacuation line may increase the cumulative visual impact together with farming and mining activities and people using the Regional Road adjacent to site. Dust will be the main factor to take into account.	- Low

Increase in construction vehicles	If damage to roads is not repaired, then this will affect the farming and mining activities in the area and result in higher maintenance costs for vehicles of locals and other road users. The costs will be borne by road users who were no responsible for the damage. However, the roads to be used from either Durban and Cape Town should be able to accommodate the construction vehicle traffic.	- Negligible
Impact of construction workers on local communities & influx of job seekers	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.	- Medium
Risk to safety, livestock and farm infrastructure.	If fire spreads to neighbouring properties, the effects will be compounded. Negligible cumulative effects, provided losses are compensated for.	- Negligible
Increased risks of grass fires.	The risk of grass fires can be mitigated and managed.	- Negligible
Heritage resources	Due to its low significance, the potential for cumulative impact is considered to be negligible.	- Negligible
Impact on traffic	The cumulative additional trips will not impact greatly on the immediate or wider road network. It	-Low
Operational Phase		
Avifaunal	It is unknown whether the collision-prone birds that occur around the area, particularly the Endangered Martial Eagle, will be pulled into the site in the dry	- Negligible

	season (to hunt around the farm dams); or, once the PV panels are in place, whether wetland birds will be attracted to them. Too little research in South Africa is presently available to determine that, and thus, a full 12 months of post-construction monitoring by trained ornithologists is a strong recommendation	
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 could cause erosion. Should these impacts occur, there may be a cumulative impact on storm water runoff in the study area.	- Medium
Loss of agricultural land	It is preferable to incur a higher cumulative loss in a region with low agricultural potential, than to lose agricultural land with a higher production potential elsewhere in the country. Because of the very low agricultural potential of the site considered in this report, its contribution to any cumulative impact is low.	- low
Change in land use	Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. The impacts can however be mitigated via relocation of farm workers and disturbed areas can be rehabilitated after the construction phase.	- Low
Visual intrusion	The operation of the PV plant and 132kV evacuation line may increase the cumulative visual impact together with the existing Eskom power infrastructure, mining in the area and agricultural infrastructure.	- Low
Consumption of water	An additional demand on water sources could result in a significant cumulative	- Medium

	impact with regards to the availability of water.	
Generation of additional electricity	The evacuation of generated electricity into the Eskom grid will strengthen and stabilize the grid (especially in the local area).	+ Low
Establishment of a community trust	Promotion of social and economic development and improvement in the overall well-being of the community.	+ Medium
Change in the sense of place	The construction of the solar plant and associated infrastructure will increase the cumulative change in the sense of place due to industrial type infrastructure that is being proposed and the existing mining infrastructure in the region.	- Low
Development of infrastructure for the generation of clean, renewable energy	Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.	+ Medium
Decommissioning Phase		
Visual intrusion	The decommissioning of the PV plant and 132kV evacuation line may increase the cumulative visual impact together with farming and mining activities and people using the existing roads adjacent to site. Dust and housekeeping will be the main factors to take into account.	- Low
Generation of waste	An additional demand on municipal services could result in significant cumulative impacts with regards to the availability of landfill space.	- Medium

7.7 CONCLUSION

This chapter of the EIR addressed the cumulative environmental effects of the construction, operation and decommissioning project phases. The information to date has shown that no significant adverse residual impacts are likely. However, cumulative impacts could arise as other similar projects are constructed in the area.

The potential most significant cumulative impacts relate to:

- Cumulative effects during construction phase:
    - Loss or fragmentation of indigenous natural fauna and flora (- Medium)
    - Loss or fragmentation of habitats (- Medium)
    - Generation of waste (- Medium)
    - Local employment, business opportunities and training (+ Medium)
- Cumulative effects during the operational phase:
    - Consumption of water (- Medium)
    - Establishment of a community trust (+ Medium)
    - Development of infrastructure for the generation of clean, renewable energy (+ Medium)
- Cumulative effects during the decommissioning phase:
    - Generation of waste (- Medium)

8 ENVIRONMENTAL IMPACT STATEMENT

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

Appendix 3. (3) An EIR (...) must include-

(l) an environmental impact statement which contains-

(i) a summary of the key findings of the environmental impact assessment:

(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and

(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;

(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;

8.1 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 construction phase:
  - Impacts on the fauna and flora (- Low)
  - Impacts on soil (- Low)
  - Impacts associated with the geology of the site (- Low)
  - Impacts on existing services infrastructure (- Low)
  - Impacts on surface water features (non-perennial wetland) (- Low)
  - Temporary employment and other economic benefits (+ Medium)
  - Impacts on heritage resources (- Low)
  - Traffic impacts (- Low)

- Impacts during the operational phase:
    - Impacts on the fauna and flora
        - Avifauna Fatalities (- Medium)
        - Nesting for Birds (+ Medium)
    - Impacts associated with the soil (- Low)
    - Impacts associated with the geology of the site (- Low)
    - Impacts on surface water features (non-perennial wetland) (- Low)
    - Increase in employment and other economic benefits (+ Medium)
    - Visual impacts (- Low)
    - Generation of income to the Local Community (+ Medium)
    - Pressure on existing services infrastructure and water sources. (- Low)
    - Impacts on heritage resources (- Low)
    - Additional electricity generation (+ Medium)
- Impacts during the decommissioning phase:
    - Loss of permanent employment (- Low) &
      the creation of temporary employment (+ Low)
    - Impacts on surface water features and soil erosion (non-perennial wetland) (- Low)
    - Impacts on heritage resources (- Low)
    - Generation of waste (-Low)

Cumulative biophysical impacts resulting from similar development in close proximity to the proposed activity.

8.2 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 Regulation 21 and Appendix 2 of the 2014 EIA Regulations – already approved by the environmental authority.
- All key consultees have been consulted as required by Chapter 6 of the 2014 EIA Regulations - already approved by the environmental authority.
- The EIA process has been conducted as required by the 2014 EIA Regulations, Regulations 23 and Appendix 3.
- The EMPr has been compiled in accordance with Appendix 4 of the 2014 EIA Regulations.
- 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 Kagiso Solar Power Plant and associated infrastructure, Registration Division Kuruman, Northern Cape Province 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.
- All actions and task allocated in the EMPr should not be neglected and a copy of the EMPr should be made available onsite at all times.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

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

Marelie Griesel

Environamics - Environmental Consultants

9 REFERENCES

ANON. nd. Guidelines for Environmental Impact Assessments. http://redlist.sanbi.org/eiaguidelines.php

ACTS see SOUTH AFRICA

BODEN, T.A., G. MARLAND, and R.J. ANDRES. 2011. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.

BOTHA, A. J. 2016. The proposed Boitshoko Solar Power Plant near Kath, Northern Cape Province. Visual Impact Assessment.

CONSTITUTION *see* SOUTH AFRICA. 1996.

DEPARTMENT OF ENERGY (DoE). Integrated Resource Plan 2010-2030

DEPARTMENT OF MINERALS AND ENERGY (DME). 2003. White Paper on Renewable Energy.

ENERGY BLOG. 2015. Energy Blog – Project Database. [Web:] http://www.energy.org.za/knowledge-tools/project-database?search=project lookup&task=search [Date of assess: 28 September 2015].

FIRST SOLAR. 2011. PV Technology comparison.

GAMAGARA LOCAL MUNICIPALITY. 2015. Gamagara Local Municipality Integrated Development Plan for 2015 – 2017.

GÖTZE, A. R. and KOTZE, L. 2016. Faunal and Floral Diversity and Habitat Assessment for the project Boitshoko Solar Power Plant (Pty) Ltd. near Kathu on the Remaining Extent of portion 1 of the farm Lime Bank No. 471, Registration Division Kuruman, Northern Cape.

JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY. John Taolo Gaetsewe District Municipality Integrated Development Plan for 2012 – 2016.

KRUGER, L. 2016. Social Impact Assessment for Boitshoko Solar (RF) (Pty) Ltd Energy Facility, Northern Cape Province.

MUCINA, L. AND RUTHERFORD, M.C. 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

NATIONAL DEPARTMENT OF AGRICULTURE. 2006. Development and Application of a Land Capability Classification System for South Africa.

NERSA. 2009. South Africa Renewable Energy Feed-in Tariff (REFIT) – Regulatory Guidelines.

RUSSOUW. L. 2016. Phase 1 Palaeontological Assessment of the proposed Boitshoko solar power plant (SPP) facility on the Remaining Extent of Portion 1 the farm Limebank 471, near Kathu, Northern Cape Province.

SANBI. 2016. Guidelines for Environmental Impact Assessments. [Web:] http://redlist.sanbi.org/eiaguidelines.php. Date of access: 26 April 2016.

SOLARGIS. 2011. Global Horizontal Irradiation (GHI). [Web:] http://solargis.info/doc/71 [Date of access: 7 May 2014].

SOUTH AFRICA(a). 1998. The Conservation of Agricultural Resources Act, No. 85 of 1983. Pretoria: Government Printer.

SIMMONS, R. and MARTINS, M. 2016. Pre-construction Avian Impact Assessment of the Boitshoko PV Solar Power plant, near Kathu, Northern Cape

SOUTH AFRICA. 1996. Constitution of the Republic of South Africa as adopted by the Constitutional Assembly on 8 May 1996 and as amended on 11 October 1996. (B34B-96.) (ISBN: 0-260-20716-7.)

SOUTH AFRICA(a). 1998. The National Environmental Management Act, No. 107 of 1998. Pretoria: Government Printer.

SOUTH AFRICA(b). 1998. The National Water Act, No. 36 of 1998. Pretoria: Government Printer.

SOUTH AFRICA. 1999. The National Heritage Resources Act, No. 25 of 1999. Pretoria: Government Printer.

SOUTH AFRICA. 2004. The National Environment Management: Air Quality Act, No. 39 of 2004. Pretoria: Government Printer.

SOUTH AFRICA(a). 2008. The National Energy Act, No. 34 of 2008. Pretoria: Government Printer.

SOUTH AFRICA(b). 2008. The National Environmental Management: Waste Act, No. 59 of 2008. Pretoria: Government Printer.

SOUTH AFRICA. Minister in the Presidence: Planning. 2009. *Medium Term Strategic Framework. – A Framework to guide Governments Programme in the Electoral Mandate Period 2009-2014*.

SOUTH AFRICA. 2010. Regulations in terms of Chapter 5 of the National Environmental Management Act, 1998. (GNR. 543, 544 and 545. 2010.). Pretoria: Government Printer.

SWINGLER, S. 2006. Statistics on Underground Cable in Transmission networks, Final Report of CIGRE Working Group B1.07.

THE MESOTHELIOMA CENTRE. 2016. Mesothelioma in South Africa. [Web:] http://www.asbestos.com/mesothelioma/south-africa/. [Date of access: 27 June 2016].

VAN SCHALKWYK, J. 2016. Cultural heritage impact assessment for the development of the proposed Boitshoko Solar Power Plant (Pty) Ltd. near Kathu on the Remaining Extent of portion 1 of the farm Lime Bank No. 471, Registration Division Kuruman, Northern Cape.

WORLD BANK GROUP. 2006. The Equator Principles.