



FINAL ENVIRONMENTAL IMPACT
ASSESSMENT REPORT
13 June 2016

**THE PROPOSED GROOTPOORT PHOTOVOLTAIC SOLAR ENERGY
FACILITY NEAR LUCKHOFF, FREE STATE PROVINCE**

PROJECT DETAIL

DEA Reference No. : 14/12/16/3/3/2/835

Project Title : Proposed Grootpoort Photovoltaic Solar Energy Facility near Luckhoff, Free State Province

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Client : Pele Green Energy (Pty) Ltd.

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TABLE OF CONTENTS

PROJECT DETAIL	1
TABLE OF CONTENTS.....	2
LIST OF TABLES	5
LIST OF FIGURES	6
PLATES.....	6
APPENDICES.....	7
GLOSSARY OF TERMS AND ACRONYMS.....	8
EXECUTIVE SUMMARY	9
EXECUTIVE SUMMARY	10
1 INTRODUCTION.....	14
1.1 LEGAL MANDATE AND PURPOSE OF THE REPORT	14
1.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP).....	16
1.3 DETAILS OF SPECIALISTS	17
1.4 STATUS OF THE EIA PROCESS.....	17
1.5 STRUCTURE OF THE REPORT.....	20
2 ACTIVITY DESCRIPTION.....	24
2.1 THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION	24
2.2 ACTIVITY DESCRIPTION	26
2.3 PHOTOVOLTAIC TECHNOLOGY	27
2.4 LAYOUT DESCRIPTION.....	28
2.5 SERVICES PROVISION	29
3 LEGISLATIVE AND POLICY CONTEXT.....	31

3.1	INTRODUCTION	31
3.2	LEGISLATIVE CONTEXT	33
3.3	POLICY CONTEXT	37
3.4	OTHER LEGISLATION	44
3.5	RELEVANT GUIDANCE	44
3.6	CONCLUSION	44
4	THE NEED AND DESIRABILITY	46
4.1	THE NEED FOR THE PROPOSED ACTIVITY	46
4.2	THE DESIRABILITY OF THE PROPOSED ACTIVITY	46
5	DESCRIPTION OF ENVIRONMENTAL ISSUES	49
5.1	CONSIDERATION OF ALTERNATIVES	49
5.1.1	No-go alternative	49
5.1.2	Location alternatives	50
5.1.3	Activity alternatives	51
5.1.4	Technical alternatives	52
5.1.5	Design and layout alternatives	52
5.1.6	Technology alternatives	53
5.2	PUBLIC PARTICIPATION PROCESS	54
5.2.1	General	54
5.2.2	Consultation process	59
5.2.3	Registered I&APs	59
5.2.4	Issues raised by IAPs and consultation bodies	60
5.3	THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT	62
5.3.1	Biophysical environment	62
5.3.2	Description of the socio-economic environment	70

6	DESCRIPTION OF THE IMPACTS AND RISKS	74
6.1	SCOPING METHODOLOGY	75
6.1.1	Checklist analysis.....	75
6.1.2	Matrix analysis	77
6.2	KEY ISSUES IDENTIFIED.....	91
6.2.1	Impacts during the construction phase.....	91
6.2.2	Impacts during the operational phase	91
6.2.3	Impacts during the decommissioning phase	92
6.3	ASPECTS TO BE ASSESSED	92
6.4	SUMMARY OF RECOMMENDATIONS FROM SPECIALIST STUDIES	93
6.4.1.	Issue 1: Geotechnical suitability	94
6.4.2.	Issue 2: Heritage and archeological impacts.....	94
6.4.3.	Issue 3: Ecological Impacts.....	95
6.4.4	Issue 4: Avifaunal Impacts	96
6.4.5	Issue 5: Visual Impacts	96
6.4.6	Issue 6: Agricultural / impacts on the soil	97
6.4.7	Issue 7: Socio-economic impacts.....	97
6.5	METHOD OF ENVIRONMENTAL ASSESSMENT	98
6.5.1	Impact Rating System	98
7	CUMULATIVE EFFECTS ASSESSMENT	103
7.1	INTRODUCTION.....	103
7.2	GEOGRAPHIC AREA OF EVALUATION	103
7.3	TEMPORAL BOUNDARY OF EVALUATION	104
7.4	OTHER PROJECTS IN THE AREA	105
7.4.1	Existing projects in the area	105
7.4.2	Projects in the foreseeable future.....	106

7.5	SPECIALIST INFORMATION ON CUMULATIVE EFFECTS	106
7.5.1	Geology.....	107
7.5.2	Soil, Land Capability and Agricultural Potential.....	107
7.5.3	Hydrology.....	107
7.5.4	Ecology.....	107
7.5.5	Birds.....	108
7.5.6	Social Impact Assessment.....	109
7.5.7	Visual.....	109
7.5.8	Heritage	109
7.6	IMPACT ASSESSMENT	109
7.6.1	Potential Cumulative Effects	110
7.7	CONCLUSION.....	113
8	ENVIRONMENTAL IMPACT STATEMENT	115
8.1	SUMMARY OF KEY FINDINGS AND ASSESSMENT RESULTS	115
8.2	RECOMMENDATION OF EAP.....	116
9	REFERENCES.....	118

LIST OF TABLES

Table 1.1: Listed activities

Table 1.2: Details of specialists

Table 1.3: Project schedule

Table 1.4: Structure of the report

Table 2.1: General site information

Table 2.2: Listed activities ¹

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

¹ Please refer to Table 6.2 for a detailed description of the relevant aspects of the development that will apply to each specific listed activity.

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

Table 5.1: Issues raised by key consultation bodies

Table 5.2: Areas of vegetation communities at the Grootpoort study area

Table 5.3: Summary of identified heritage resources in the area

Table 6.1: Environmental checklist

Table 6.2: Matrix analysis

Table 6.3: Aspects to be assessed

Table 6.4: The rating system

Table 7.1: Potential Cumulative Effects for the proposed project

LIST OF FIGURES

Figure 1: Locality Map

Figure 2: Regional Map

Figure 3: Footprint map

Figure 4: Land capability classification Map

Figure 5: Vegetation Map

Figure 6: Sensitivity Map

Figure 7: Cumulative Impacts Map

Figure 8: Alternative locations on the farm Grootpoort 168

Figure 9: Horizontal irradiation for South Africa

Figure 10: Surrounding land owners

Figure 11: Contours of the site.

Figure 12: Geographic area of evaluation

Figure 13: Utility-scale Renewable Energy Generation Sites

Figure 14: National Wind and Solar PV SEA: Renewable Energy EIA Application Received before Dec. 2012

PLATES

Plate 1: The site (taken towards the north)

Plate 2: The site (taken towards the north-east)

Plate 3: The site (taken towards the east)

- Plate 4: The site (taken towards the south-east)
- Plate 5: The site (taken towards the south)
- Plate 6: The site (taken towards the south-west)
- Plate 7: The site (taken towards the west)
- Plate 8: The site (taken towards the north-west)
- Plate 9: Gravel access road (taken towards the south-east)
- Plate 10: Site Access
- Plate 11: Vegetation on site
- Plate 12: Drainage lines situated in the north western portion of the site
- Plate 13: Drainage lines situated in the north western portion of the site

APPENDICES

- Appendix A: EAP declaration
- Appendix B: Press advertisement
- Appendix C: On site notice
- Appendix D: List of I&APs
- Appendix E: Proof of correspondence
- Appendix F: Written comments
- Appendix G: Assessment
 - Appendix G1: Significance Rating of Potential Impacts
- Appendix H: Specialist Reports
 - Appendix H1: Geotechnical Assessment
 - Appendix H2: Ecological Fauna and Flora Habitat Survey
 - Appendix H3: Hydrology Impact Assessment
 - Appendix H4: Avifaunal Study
 - Appendix H5: Visual Impact Assessment
 - Appendix H6: Soil, Land Capability and Agricultural Study
 - Appendix H7: Heritage Impact Assessment
 - Appendix H8: Social Impact Assessment
 - Appendix H9: Palaeontological Impact Assessment
- Appendix I: Environmental Management Programme (EMPr)
- Appendix J: Public meeting

GLOSSARY OF TERMS AND ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
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
LLM	Letsemeng Local Municipality
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

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

The primary rationale for the proposed solar photovoltaic (PV) facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by DoE (Integrated Resource Plan 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, Pele Green Energy (Pty) Ltd. is proposing the development of a photovoltaic solar facility and associated infrastructure for the purpose of commercial electricity generation on an identified site located near Luckhoff in the Free State 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 1780 kWh/m²/annum.

EXECUTIVE SUMMARY

The Letsemeng Local Municipality Integrated Development Plan (IDP, 2015/16) indicates that the majority of the population derives their livelihoods from the informal sector including pensions, disability grants as well as seasonal work. The unemployment figures pose a mammoth challenge to Letsemeng Local Municipality which enforces the need to develop more social support programmes and job creation initiatives that will reduce the unemployment rate significantly. The municipality is also experiencing an influx of informal settlements, which compromises the municipality's ability to address basic services backlogs and improve the level of infrastructure development in its locality.

In response to the above Pele Green Energy (Pty) Ltd. intends to develop up to 100MW photovoltaic solar facility and associated infrastructure on the farm Grootpoort 168, Registration Division Fauresmith, Free State situated within the Letsemeng Local Municipality area of jurisdiction. The town of Luckhoff is located approximately 14km south west 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 250 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 (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 (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.”*
- Activity 12(xii)(a)(c) (GN.R. 983): *“The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse or (c) ...within 32 metres of a watercourse, measured from the edge of a watercourse.”*
- Activity 19(i) (GN.R. 983): *“The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse...”*
- 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 hectares 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 Pele Green Energy’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 and closure outcomes 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, surface water (non-perennial stream), existing services infrastructure, socio-economic impacts such as the provision of temporary employment and other economic benefits, and the impacts on heritage resources.

Impacts during the operational phase:

During the operational phase the study area will serve as a solar PV energy facility and the potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with impacts on the fauna and flora, soils, geology, the increased consumption of water, and visual impacts. The provision of sustainable services delivery also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community.

Impacts during the decommissioning phase:

The physical environment will benefit from the closure of the solar facility since the site will be restored to its natural state. The decommissioning phase will result in the loss of permanent employment. However, skilled staff will be eminently employable and a number of temporary jobs will also be created during the decommissioning phase.

Cumulative impacts:

Cumulative impacts could arise as other similar projects are constructed in the area. According to the Energy Blog's database seven (7) other solar PV plant has been granted preferred bidder status within close proximity to the proposed Grootpoort PV plant, as well as two (2) wind energy projects. However, according to the Department's database twenty-eight (28) other solar plants have been proposed in relative close proximity to the proposed activity, with the majority of the projects in the De Aar Region.

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 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 will contain information that is necessary for the competent authority to consider the application and to reach a decision contemplated in Regulation Appendix 3 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 2(2) A environmental impact assessment report 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:

- (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, 984 and 985 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 ²

Relevant notice:	Activity No (s)	Description of each listed activity as per project description:
GNR. 983, 4 December 2014	Activity 11(i)	<ul style="list-style-type: none">• <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."</i>• Activity 11(i) is triggered since the proposed photovoltaic solar facility will transmit and distribute

² Please refer to Table 6.2 for a detailed description of the relevant aspects of the development that will apply to each specific listed activity.

		electricity of 132 kilovolts outside an urban area.
GNR. 983, 4 December 2014	Activity 12(xii)(a)(c)	<ul style="list-style-type: none"> • <i>“The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse or (c) ...within 32 metres of a watercourse, measured from the edge of a watercourse.”</i> • Activity 12(wii)(a)(c) is triggered since a watercourse (non-perennial stream) is located on the site and the proposed photovoltaic solar facility may result in the construction of infrastructure or structures covering 100m² or more within a watercourse or within 32m of the watercourse.
GNR. 983, 4 December 2014	Activity 19(i)	<ul style="list-style-type: none"> • <i>“The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse...”</i> • Activity 19 is triggered since a watercourse (non-perennial stream) is located on the site and the proposed photovoltaic solar facility may result in the infilling or depositing of material of more than 5m³ into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from a watercourse.
GNR. 984, 4 December 2014	Activity 1	<ul style="list-style-type: none"> • <i>“The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.”</i> • Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 100MW megawatts electricity.
GNR. 984, 4 December 2014	Activity 15	<ul style="list-style-type: none"> • <i>“The clearance of an area of 20 hectares or more of indigenous vegetation.”</i> • In terms of vegetation type the site falls within the Northern Upper Karoo vegetation type, which is described by Mucina and Rutherford (2006) as ‘least threatened’. The site has not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed.

Being listed under Listing Notice 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) that is 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 scoping report. The draft EIR was made available to registered I&APs and all relevant State Departments. They were requested to provide written comments on the report within 30 days of receiving it. All issues identified during this review period are documented and compiled into a Comments and Response Report included 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 a 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 reports.

Table 1.2: Details of specialists

Study	Prepared by	Contact Person	Postal Address	Tel	e-mail
Avifaunal	Dr. Williams Bird Surveys	Dr A.J. Williams	52 Circle Road, Tableview 7441	Tel. 021 556 1284: Cell 084 50 55 450	capeokapi@gmail.com
Ecological Impact Assessment	Hudson Ecology (Pty) Ltd.	A. Hudson	P.O. Box 19287 Noordbrug 2522 South Africa	Tel. 018 294 5448 Cell 082 344 2758	adrian@hudsonecology.co.za
Geotechnical Assessment	Soilkraft cc	F. J. Breytenbach	PO Box 73478 Lynnwood Ridge 0040	Tel. 012-9910426	izak@soilkraft.co.za
Heritage Impact Assessment	J van Schalkwyk (D Litt et Phil), Heritage Consultant	J van Schalkwyk	62 Coetzer Avenue, Monument Park, 0181	Cell 076 790 6777	jvschalkwyk@mweb.co.za
Hydrological Impact Assessment	Consultant in Water Technology	Cas Coetzer	882 Beyers Street Rietfontein, Pretoria 0084	Tel. 012 331 1033 Cell 083 230 8752	cas52@mweb.co.za
Social Impact Assessment	Knowledge Pele	Fumani Mthembi	-	Tel. 011 262 0515	f.mthembi@knowledgepele.com
Agriculture and Soils Impact Assessment	Environment Research Consulting	A.R. Götze	-	Cell 082 789 4669	erc@telkomsa.net
Visual Impact Assessment	Phala Environmental Consultants	Johan Botha	7a Botha Street Potchefstroom North West Province 2526	Tel. 082 316 7749	phala@safrica.com
Paleontological Study	Natura Viva CC	Dr. John E. Almond	P. O. Box 12410 Mill Street Cape Town, 8010	-	naturaviva@universe.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 on 30 July 2015 and 10 September 2015 to discuss the proposed development and assess the site.
- The public participation process was initiated on 14 August 2015 and all I&APs were requested to submit their comments by 14 September 2015.
- A fully completed application form was submitted to the National Department of Environmental Affairs (DEA) on 30 September 2015 and the Department registered the application on the 6 October 2015.
- A fully completed application form and the Draft Scoping Report was made available to registered I&APs and relevant State Departments on 29 September 2015 and they were requested to provide their comments on the report within 30 days of the notification (29 October 2015).
- The Final Scoping Report (FSR) was submitted to the Department of environmental Affairs on 12 November 2015.
- The Department of Environmental Affairs accepted the Final Scoping Report in a letter dated 15 December 2015.
- The Draft EIR was submitted to the Department of Environmental Affairs on 18 March 2016 and was made available to registered I&APs and relevant State Departments on 18 March 2016. They were requested to provide their comments on the report within 30 days of the notification (20 April 2016).
- On 22 April 2016 a request was sent to the Department of Environmental Affairs to extend the timeframe with 50 days.
- The Amended Draft EIR (including the final Avifaunal Report) was submitted to the Department of Environmental Affairs on 22 April 2016 and was made available to registered I&APs and relevant State Departments on 22 April 2016. They were requested to provide their comments on the report within 30 days of the notification (24 May 2016).
- A Public Meeting was held on 30 May 2016. All registered I&APs were invited to attend by email and a newspaper advertisement was placed on 28 May 2016.

It is envisaged that the Final Environmental Impact Report will be accepted by the Department in mid-June. The EIA process should be completed within approximately four months of submitting the Final EIR, i.e. by October 2016 – see Table 1.3.

Table 1.3: Project schedule

Activity	Prescribed timeframe	Timeframe
Site visit		30 July 2015
Conduct specialist studies	-	Mid Sep – early Dec 2015
Pre-application meeting		30 July 2015
Public participation (BID)	30 Days	14 Aug – 14 Sep2015
Submit application form and DSR	-	17 Sep 2015
Public participation (DSR)	30 Days	17 Sep - 19 Oct 2015
Appoint Avifaunal Specialist	6 Months	26 Oct. 2015 –April 2016
Submit FSR	-	Nov 2015
Department acknowledges receipt	10 Days	Nov 2015
Department approves/reject	43 Days	15 December 2015
Public participation (DEIR)	30 Days	18 March – 20 April 2016
Ask DEA for extension on timeframe	50 Days	22 April 2016
Receive Avifaunal Study	-	April 2016
Public participation (DEIR) (Round 2)	30 Days	May - June 2016
Submission of FEIR & EMPr	-	13 June 2015
Department acknowledges receipt	10 Days	June 2016
Decision	107 Days	September 2016
Department notifies of decision	5 Days	September 2016
Registered I&APs notified of decision	14 Days	September 2016
Appeal	20 Days	October 2016

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 a scoping report 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	14-22
	(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	23-29
	(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-	3	30-43
	(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.	4	44-46
(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;	5	47-69
(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;		

	<p>(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;</p> <p>(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.</p> <p>(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;</p> <p>(ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and</p> <p>(x) a concluding statement indicating the preferred alternative development location within the approved site.</p>		
	<p>(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;</p> <p>(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;</p> <p>(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;</p> <p>(viii) the possible mitigation measures that could be applied and level of residual risk;</p>		
(i)	<p>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-</p> <p>(i) a description of all environmental issues and risks that were identified during the EIA process; and</p> <p>(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.</p>	6	71-99
(j)	<p>an assessment of each identified potentially significant impact and risk, including-</p> <p>(i) cumulative impacts;</p> <p>(ii) the nature, significance and consequences of the impact and risk;</p> <p>(iii) the extent and duration of the impact and risk;</p> <p>(iv) the probability of the impact and risk occurring;</p> <p>(v) the degree to which the impact and risk can be reversed;</p> <p>(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and</p>		

	(vii) the degree to which the impact and risk can be mitigated;		
(k)	(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- (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;	7	100-109
(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;		
(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;	7	100-109
(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- (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;	Appendix A to the report	

(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- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	Not applicable
(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 applied 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.

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 farm Grootpoort 168, Registration Division Fauresmith, Free State situated within the Letsemeng Local Municipality area of jurisdiction. The proposed development is located in the Free State Province (refer to Figure 2 for the regional map). The town of Luckhoff is located approximately 14km south west of the proposed development (refer to Figure 1 for the locality map).

The project entails the generation of up to 100MW electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 250 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 Pele Green Energy (Pty) Ltd. from the property owner, Mr. Johannes Freund, for the life span of the project (minimum of 20 years).

Table 2.1: General site information

Description of affected farm portion	Portion 1 of the farm Grootpoort 168, Registration Division Fauresmith, Free State
21 Digit Surveyor General codes	F011000000001680001
Title Deed	T14153/2011
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 250 hectares
Structure orientation	The panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.
Laydown area dimensions	Approximately 250 hectares
Generation capacity	100MW
Expected production	130-160 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 game and sheep – refer to plates 1-13 for photographs of the development area. The property on which the development is to be established is owned by the Mr. Johannes Delpport Freund.

2.2 ACTIVITY DESCRIPTION

The proposed development will trigger the following activities:

Table 2.2: Listed activities ³

Relevant notice:	Activity No (s)	Description of each listed activity as per project description:
GNR. 983, 4 December 2014	Activity 11(i)	<ul style="list-style-type: none"> • <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.”</i> • 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 12(xii)(a)(c)	<ul style="list-style-type: none"> • <i>“The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse or (c) ...within 32 metres of a watercourse, measured from the edge of a watercourse.”</i> • Activity 12 is triggered since a watercourse (non-perennial stream) is located on the site and the proposed photovoltaic solar facility may result in the construction of infrastructure or structures covering 100m² or more within a watercourse or within 32m of the watercourse.
GNR. 983, 4 December 2014	Activity 19(i)	<ul style="list-style-type: none"> • <i>“The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse...”</i> • Activity 19 is triggered since a watercourse (non-perennial stream) is located on the site and the proposed photovoltaic solar facility may result in the infilling or depositing of material of more than 5m³ into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from a watercourse.
GNR. 984, 4 December	Activity 1	<ul style="list-style-type: none"> • <i>“The development of facilities or infrastructure for the generation of electricity where the electricity</i>

³ Please refer to Table 6.2 for a detailed description of the relevant aspects of the development that will apply to each specific listed activity.

2014		<p><i>output is 20 megawatts or more.”</i></p> <ul style="list-style-type: none"> • Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 100MW megawatts electricity.
GNR. 984, 4 December 2014	Activity 15	<ul style="list-style-type: none"> • <i>“The clearance of an area of 20 hectares or more of indigenous vegetation.”</i> • In terms of vegetation type the site falls within the Northern Upper Karoo vegetation type, which is described by Mucina and Rutherford (2006) as ‘least threatened’. 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 where reasonably possible. 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 100MW, 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.
- 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. Whilst Pele Green Energy (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 Canal Substation. Although the generation capacity is 100MW the capacity at the point of connection with Eskom will be a maximum of 75MW.
- Supporting Infrastructure - A control facility with basic services such as water and electricity will be constructed on the site and will have an approximate footprint 500m². Other supporting infrastructure includes voltage and current regulators and protection circuitry.
- Roads – Access will be obtained via a local gravel road of the R48. An internal site road network will also be required to provide access to the solar field and associated infrastructure. All site roads will require a width of approximately 4m.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.

2.4 LAYOUT DESCRIPTION

The layout plan will follow the limitations of the site and aspects such as environmentally sensitive areas, roads, fencing and servitudes will be considered. The total surface area proposed for layout options include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, transmission lines and perimeter fences). Due to the nature of the site being used for grazing (refer to the Plates), limited features of environmental significance exist apart from non-perennial streams and areas with erosion located in close proximity to the site.

Table2.3: General Layout information

Grootpoort Solar Park	Fixed Polycrystalline 1500Vdc pitched 9m	Structure- Tracker- Polycrystalline 1500Vdc pitch 5.4m	Tracker- Polycrystalline 1500Vdc pitch 5m
Number Module	273,780	273,780	273,780
String	30 Modules	30 Modules	30 Modules
Number String	9,126	9,126	9,126
DC Power [kWp]	86,240.70	86,240.70	86,240.70
AC Power [kW]	75,000	75,000	75,000
N. Conversion Cabinet	17	17	17
Facility Fenced Area	147 Hectares	172 Hectares	160,5 Hectares
Internal Road	20,000 sqm		
Width of internal roads	Approximately 5 meters		
Capacity of on-site substation	132kV		
Area occupied by inverter / transformer station / substation	Inverter Transformer Station: 2.5 x 7.6 meters Substation: 25 x 14 meters		
Area occupied by both permanent and construction laydown areas	Permanent Laydown Area: 250 Hectares Construction Laydown Area: 713.11 meters		
Area occupied by buildings	Security Room: 66.74 meters Office: 157.6 meters Staff Locker and Changing Room: 213.745 meters		
Height of fencing	Approximately 2.5 meters		
Type of fencing	Cochrane Clearvu		

2.5 SERVICES PROVISION

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, alternatively from either a nearby canal or from the 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 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 3 880m³ 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 approximately 460 000 panels will require 3 680m³ 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 3 880 cubic liters per annum for washing, and for toilet use, drinking water, etc.

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 would be considered by the developer. Furthermore, indigenous vegetation will be used during landscaping and the staff will be trained to implement good housekeeping techniques.

Portable chemical toilets will be utilized, that will be serviced privately or by the local municipality. Waste will be disposed at a licensed waste site (such as the Koffiefontein, de Aar or Kimberley landfill sites). 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. The local Municipality was sent a service delivery request on 13 October 2015 to formally confirm that they have the capacity to provide the proposed development with these services for the lifetime of the project (20 years).

On 16 February 2016, the Letsemeng Local Municipality confirmed that they would not be able to remove the construction solid waste or general household waste to the nearest landfill site and that the Luckhoff landfill site has the capacity to accommodate waste from the construction and operational phases of the project, but the landfill site is not yet registered. The Municipality will however be able to remove sewerage from septic tanks during the construction and operational phase of the project for a fee.

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 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)
- 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)
- Free State Province Growth and Development Strategy (2004-2014)
- Xhariep District Municipality Integrated Development Plan (IDP) 2010/2011
- Letsemeng Local Municipality Integrated Development Plan (IDP) 2015/2016
- Letsemeng Spatial Development Framework (SDF)

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 countries 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), activity 12(xii)(a)(c) and

activity 19(i) listed in Regulation R983, 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.

A Water Use License under Section 21(i) will be required for the proposed development if development is to take place within 32m of a watercourse or if any material is to be deposited or removed from the watercourse, altering the bed or the banks of the watercourse. The project area falls within the D33C quaternary drainage region, which indicated that no water may be abstracted from a groundwater resource without a Water Use License, which has been confirmed by the DWS on 11 November 2015.

National Environmental Management: Waste Act (Act No. 59 of 2008)	Department of Environmental Affairs (DEA)	2008	<p>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.</p> <p>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.</p>
National Environment Management: Air Quality Act (Act No. 39 of 2004)	Department of Environmental Affairs (DEA)	2004	<p>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.</p> <p>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.</p>

The National Heritage Resources Act (Act No. 25 of 1999)	South African Heritage Resources Agency (SAHRA)	1999	<p>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 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.</p> <p>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.</p> <p>A case file has been opened on SAHRIS and all relevant documents will be submitted for their comments.</p>
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983	<p>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.</p> <p>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.</p> <p>In a letter dated 18 December 2015 the Department of agriculture indicated that they have no objection against the proposed project. – Refer to Appendix F.</p>

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	<p>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:</p> <ul style="list-style-type: none"> • 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; • identify 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; & • 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 of the Republic of South Africa

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:

- 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 Energy	Department of Minerals and Energy	2003	<p>This White Paper on Renewable Energy supplements the <i>White Paper on Energy Policy</i>, 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 renewable energy in South Africa.</p> <p>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: <i>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)</i> (Executive Summary, ix).</p>
Integrated Resource Plan (IRP) for South Africa	Department of Minerals and Energy	2010-2030	<p>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.</p> <p>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 renewable; and the adjustment of</p>

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 renewables were brought forward in order to accelerate a local industry;
- To account for the uncertainties associated with the costs of renewable 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 renewable. 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 renewable; and 8,9GW of other generation sources. The Policy-Adjusted IRP has therefore resulted in an increase in the contribution from renewable from 11,4 GW to 17,8 GW.

Free State Province Growth and Development Strategy	Free State Provincial Government	2004 - 2014	<p>The provincial government of the Free State has developed a Free State Provincial Growth and Development Strategy (PGDS) Free State Vision 2030. The PGDS is the fundamental policy framework for the Free State Provincial Government. It is the embodiment of the broad strategic policy goals and objectives of the province in line with national policy objectives. The strategy addresses the key and most fundamental issues of development, spanning the social, economic and political environment. It constantly takes into account annual provincial priorities and sets broad targets in terms of provincial economic growth and development, service delivery and public service transformation.</p> <p>The Free State Provincial Growth and Development Strategy (PGDS2004/14) states that agriculture</p>
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dominates the Free State landscape. With cultivated land covering 32 000 square kilometers, and natural veld and grazing a further 87 000 square kilometers of the province. Due to climate change, Free State’s agricultural potential has been declining and this increased the level of unemployment. The FSPGDS also identifies a number of natural constraints to economic growth and development. These include, low rainfall coupled with limited soil potential and the impact of this on agriculture, limited water availability and depletion of mineral resources. The Free State Province’s objective is to achieve an economic growth of 6%-7% per annum; to reduce unemployment from 30% to 15%; to reduce the number of households living in poverty by 5% per annum; and to improve adequate infrastructure for economic growth and development.

**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 be promoted across the country and any proposed development must be evaluated on its own merit. The proposed site does fall within a REDZs.

Xhariep District Municipality Integrated Development Plan (IDP)	Xhariep District Municipality	2014/2015	<p>The Xhariep District Municipality Integrated Development Plan (IDP, 2014/15) states that the District faces various challenges ranging from widespread poverty to service delivery and infrastructure backlogs. The Municipality has a high poverty and unemployment rate (46.03%), with inadequate access to basic services such as water, sanitation; refuse collection, electricity and housing and primary health care.</p> <p>With a view to realising its developmental mandate, the District identified certain priority areas in its IDP in alignment with the four key cluster areas highlighted in the 2004-2015 Free State Growth and Development Strategy (FSGDS):</p> <ul style="list-style-type: none"> • <u>Economic growth and employment</u>: Development of agriculture, tourism, trade, mining and broad based black economic development. • <u>Social and Human Development</u>: Health services, environmental management, safety and security, disaster management, education and training, youth development, HIV/AIDS and transport, bulk water supply and sanitation. • <u>Efficient governance and administration</u>: Financial viability, intergovernmental relations, public participation and corporate governance, • <u>Justice and crime prevention</u>: More effective strategies to counter stock theft and a higher police presence and visibility. <p>The Xhariep District identified the diversifying production of energy from renewable sources such as biomass and rivers and solar to produce sufficient energy to support the industry at competitive prices, ensuring access for poor households, while reducing carbon emissions. (IDP, 2014/15:144). The IDP (2014/15) states that the rising input and energy costs (expected increases of 60%) threaten feasibility of the agriculture sector and increase the urgency for putting in place large-scale renewable energy initiatives such as solar power for both residential and business purposes.</p>
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			Electricity provision in the Xhariep District is relatively higher than national and provincial levels. Currently 72% of households have access to the grid (for lighting). The level in Letsemeng is sharply down from nearly 75% in 1996 to 64% at present. The electrification backlog has expanded greatly in Letsemeng, from 3,200 to well over 5,000 between 2001 and 2007(IDP, 2014/15:120).
Letsemeng Local Municipality Integrated Development Plan (IDP) Review	Letsemeng Local Municipality	2015/2016	<p>The Letsemeng Local Municipality Integrated Development Plan (IDP, 2015/136 states that the municipality has set itself a number of strategies, such as to provide basic services to the communities of Letsemeng Local Municipality in a sustainable manner, in place to address the backlogs on provision of basic services and to improve on the level of infrastructure development in its locality.</p> <p>The Strategic objectives that the Letsemeng Council has set are as follows:</p> <ul style="list-style-type: none"> • To provide democratic & accountable municipal services to local communities • To provide services to communities in a sustainable manner • To ensure good governance practices
Letsemeng Spatial Development Framework (SDF)	Letsemeng Local Municipality	2010-2011	The Letsemeng SDF aims to provide general direction and guide decision-making and action on all land related matters. The SDF provides spatial guidance in the form of maps and spatial development plans.

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)⁴
- 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 Environmental Impact Assessment was undertaken in accordance with the Environmental Impact Assessment Regulations (2014) published in GNR 982, in terms of Section 24(5) and 44 of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended as well as all relevant National legislation, policy documents, national

⁴ 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.

guidelines, the World Bank EHS Guidelines, the IFC Performance Standards, and the Equator Principles.

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, fueled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental responsible development, the impacts of climate change and the need for sustainable development.

The primary rationale for the proposed solar PV facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by the 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 Letsemeng Local Municipality's Integrated Development Plan (IDP, 2015/16).

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 Free State 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 350 employment opportunities will be created during the construction and operational phases.
- Indirect socio-economic benefits - The increase in the demand for services such as accommodation, transportation, security, general maintenance and catering will generate additional indirect socio-economic benefits for the local community members.

5 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
- (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. The following sections explore each type of alternative in relation to the proposed activity.

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 game and sheep (refer to the photographs of the site). However, the potential opportunity costs in terms of 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 Pele Green Energy (Pty) Ltd. in the Luckhoff area to potentially establish solar facilities. From a local perspective, the farm Grootpoort 168 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 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 3 for an illustration of the land capability classification).

Alternative locations on the farm Grootpoort 168 have been considered. However initial investigation concluded that other parts of the farm will have more significant issues related to non-perennial streams, erosion and road servitudes – refer to figure 8. Therefore, a single preferred location alternative will be assessed at this stage. Alternative locations may be reconsidered should it be required as a result of specialist studies.

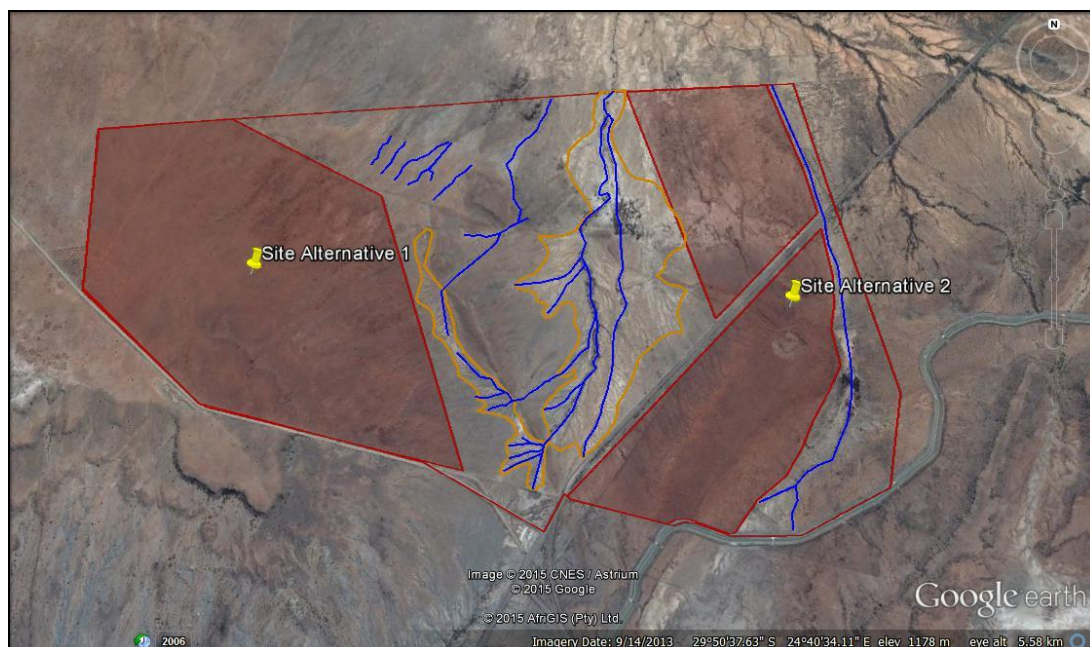


Figure 8: Alternative locations on the farm Grootpoort 168

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 – Grootpoort Solar Power Plant is part of a portfolio of solar PV projects throughout South Africa. Pele Green Energy (Pty) Ltd. is of the opinion that solar PV technology is perfectly suited to the site, given the high irradiation values for the Luckhoff area – refer to figure 9.

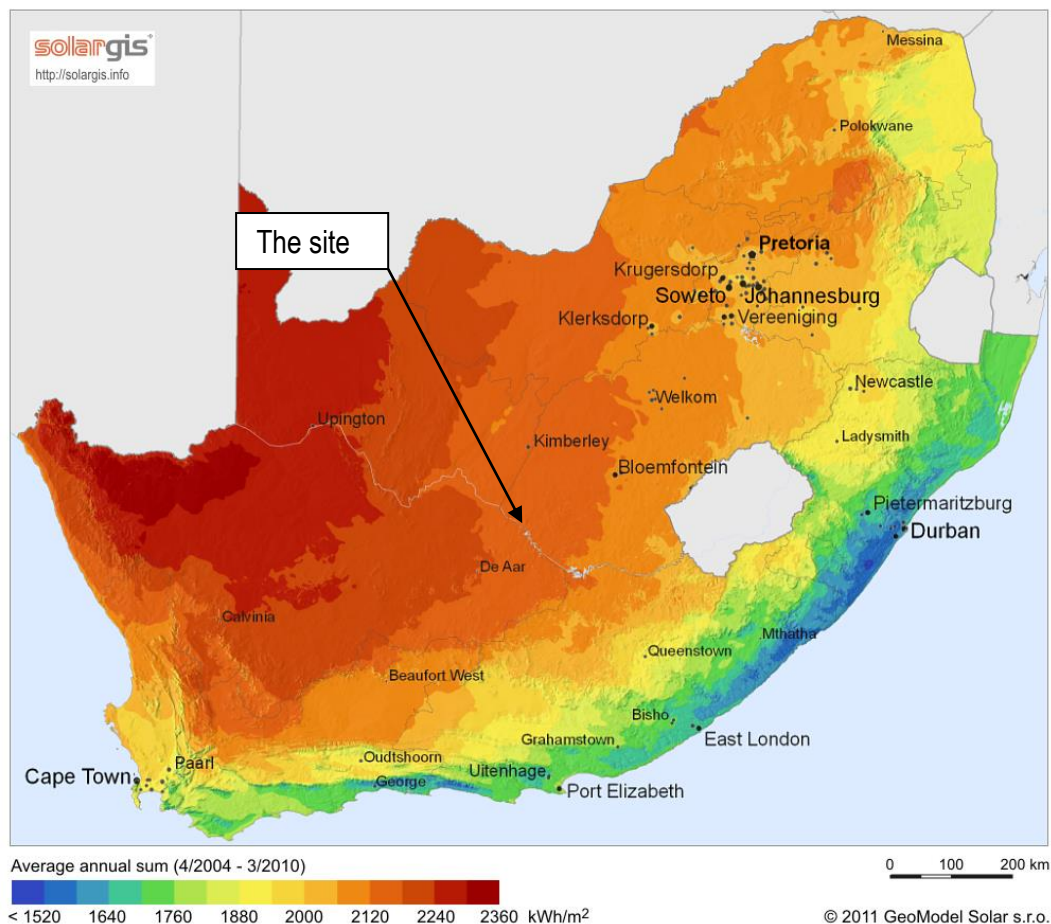


Figure 9: Horizontal irradiation for South Africa (SolarGIS, 2011)

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. The property owner indicated a mean annual rainfall of between 300-350mm.

5.1.4 Technical alternatives

It is expected that generation from the facility will tie in with the Canal Substation. The transmission line will be constructed within 36m wide servitude and will traverse the farm Grootpoort 168 and. 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 Free State Province are less likely to cause damage and faults on the proposed overhead transmission power line. Nonetheless, if a fault occurs, it can be found quickly by visual means using a manual line patrol. Repair to overhead lines is relatively simple in most cases and the line can usually be put back into service within a few days. In terms of potential impacts caused by overhead transmission lines include visual intrusion and threats to sensitive habitat (where applicable).

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

5.1.5 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 are being held between the EAP and the developer. The layout plan will be submitted as part of the EIA Report.

Design alternatives were also 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 planning consultant. The following environmental features were considered:

- How to accommodate non-perennial streams on site.
- How to accommodate areas with a high potential for erosion on site.

The layout of the Grootpoort Solar Park made provision to avoid the non-perennial stream on site as far as possible and further mitigation was provided by the Hydrology Impact

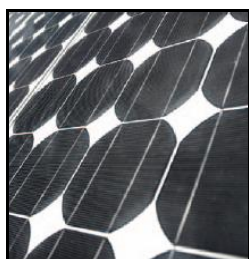
Assessment (Appendix H3) in the form of Energy Dissipation Structures, Flood Retention Ponds and Stormwater Canals. The layout plans are included in the EIR.

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:



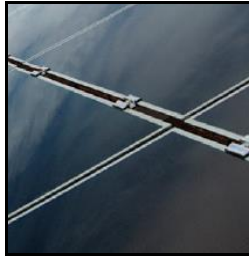
- Mono-crystalline Silicon - mono-crystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Mono-crystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and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

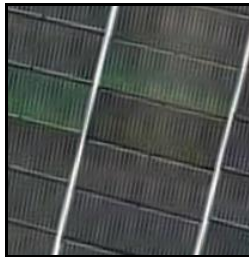
Thin film solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. The term *thin film* refers to the amount of semiconductor material used. It is applied in a thin film to a surface structure, such as a sheet of glass. Contrary to popular belief, 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 site already being degraded and the fact that no conflicts were foreseen between potentially affected parties, no additional public

participation mechanisms were considered at this stage of the process. The following actions have already been taken:

➤ Newspaper advertisement

Since the proposed development is unlikely to result in any impacts that 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 (Volksblad) on the 14 August 2015 (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 30 July 2015 to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs were given the opportunity to raise comments by 14 September 2015. 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 on 14 August 2015 and were requested to submit comments by 14 September 2015. For a complete list of stakeholder details see Appendix D and for proof of registered post see Appendix E. The consultees included:

- Free State Department of Economic Development, Tourism and Environmental Affairs (FSDEDTEA)
- The Department of Energy
- The Free State Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The Free State Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), Free State
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Municipal Manager at the Xhariep District Municipality
- The Municipal Manager at the Letsemeng Local Municipality
- The Local Councilor at the Letsemeng Local Municipality

- The Civil Aviation Authority (CAA)
- The Free State Department of Public Works, Roads and Transport

It was expected from I&APs to provide their inputs and comments by 14 September 2015.

➤ Direct notification of surrounding land owners and occupiers

Written notices were also provided to all surrounding land owners and occupiers on 14 August 2015. The Lesemeng Local Municipality and other local property owners were contacted to obtain surrounding land ownership detail; two farm's detail could not be obtained. The surrounding land owners were given the opportunity to raise comments by 14 September 2015. To date only Mr. Jan Combrink of the Remaining Extent of farm Grootpoort 168 registered as an I&AP (see Appendix F for written comments). For a list of surrounding land owners see Appendix D.

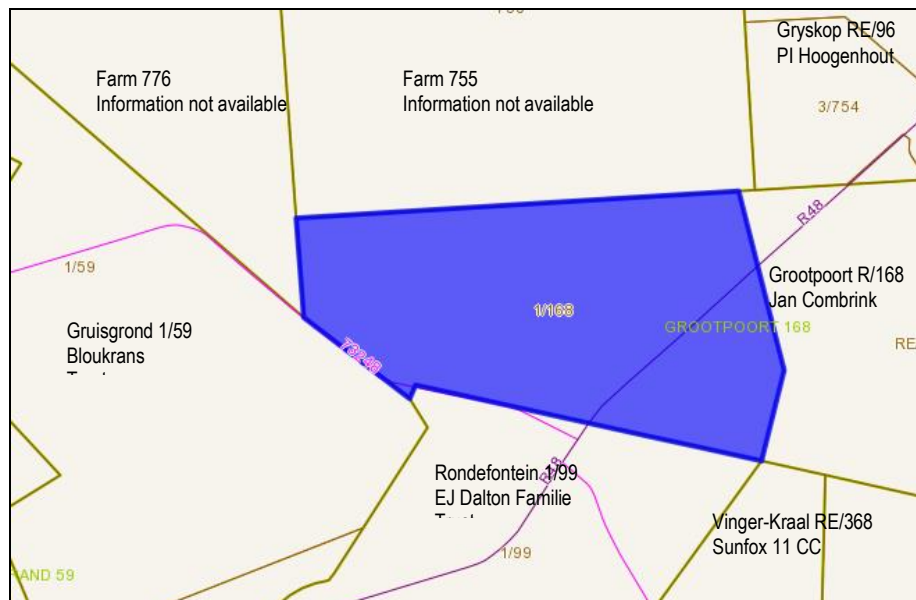


Figure 10: Surrounding Land Owners

➤ Circulation of the Draft Scoping Report

The following registered I&APs and State Department were informed of the availability of the Draft Scoping Report (refer to Appendix E):

- Free State Department of Economic Development, Tourism and Environmental Affairs (FSDEDTEA)
- The Department of Energy
- The Free State Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The Free State Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)

- The Provincial Heritage Resources Agency (PHRA), Free State
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Municipal Manager at the Xhariep District Municipality
- The Municipal Manager at the Letsemeng Local Municipality
- The Local Councilor at the Letsemeng Local Municipality
- The Civil Aviation Authority (CAA)
- The Free State Department of Public Works, Roads and Transport
- Mr. Jan Combrink

To date the only comments received were from Eskom, the Department of Water and Sanitation and the Department of Agriculture and Fisheries (see Appendix F for written comments).

➤ 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 18 March 2016 (refer to Appendix E):

- Free State Department of Economic Development, Tourism and Environmental Affairs (FSDEDTEA)
- The Department of Energy
- The Free State Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The Free State Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), Free State
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Municipal Manager at the Xhariep District Municipality
- The Municipal Manager at the Letsemeng Local Municipality
- The Local Councilor at the Letsemeng Local Municipality
- The Civil Aviation Authority (CAA)
- The Free State Department of Public Works, Roads and Transport

- Mr. Jan Combrink

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 EIR (by 21 April 2016). To date the only comments received were from the Department of Water and Sanitation and the Department of Agriculture and Fisheries (see Appendix F for written comments).

➤ Circulation of the Amended Draft Environmental Impact Assessment Report

The following registered I&APs and State Department were informed of the availability of the Amended Draft EIR on 22 April 2016 (refer to Appendix E):

- Free State Department of Economic Development, Tourism and Environmental Affairs (FSDEDTEA)
- The Department of Energy
- The Free State Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The Free State Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), Free State
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Municipal Manager at the Xhariep District Municipality
- The Municipal Manager at the Letsemeng Local Municipality
- The Local Councilor at the Letsemeng Local Municipality
- The Civil Aviation Authority (CAA)
- The Free State Department of Public Works, Roads and Transport
- Mr. Jan Combrink

It was expected from I&APs to provide their inputs and comments within 30 days after receipt of the notification or copy of the Amended Draft EIR (by 24 May 2016). To date no additional comments were received (see Appendix F for written comments).

➤ Public Participation meeting

All I&APs were invited to attend the public meeting held at the site proposed for the development, on 30 May 2016 at 12:30. The public meeting is 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 (Volksblad) on 28 May 2016 to notify the public of

the public meeting. The following key stakeholders were also directly informed of the public meeting via email on 21 May 2016:

- Free State Department of Economic Development, Tourism and Environmental Affairs (FSDEDTEA)
- The Department of Energy
- The Free State Department of Energy
- The Department of Water Affairs
- The National Department of Agriculture
- The Free State Department of Agriculture
- The South African Heritage Resources Agency (SAHRA)
- The Provincial Heritage Resources Agency (PHRA), Free State
- ESKOM
- National Energy Regulator of South Africa (NERSA)
- The Wildlife and Environment Society of South Africa (WESSA)
- The Municipal Manager at the Xhariep District Municipality
- The Municipal Manager at the Letsemeng Local Municipality
- The Local Councilor at the Letsemeng Local Municipality
- The Civil Aviation Authority (CAA)
- The Free State Department of Public Works, Roads and Transport
- Mr. Jan Combrink

No-one attended the public meeting (refer to Appendix J).

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 IAPs and consultation bodies

Table 5.1 summarises the comments received from consultation bodies. The full wording and original correspondence is included in Appendix F.

Table 5.1: Issues raised by key consultation bodies

Organisation	Person	Written comment (see Appendix F)
I&AP	Mr. Jan Combrink of the Remaining Extent of the farm Grootpoort 168	On 8 September 2015 Mr. Jan Combrink requested via telephone that we send him the background information document (BID).
Department of Water and Sanitation	Sibo Mdhuli Water Regulations	On 5 October 2015 Sibho Mdhuli acknowledged receipt of the draf scoping report and indicated that Dumisani will provide comments on the report and for further inquiries to the report Dumisani can be contacted on 082 895 3465.
ESKOM	John Geeringh Eskom GC: Land Development	On 2 September 2015 Mr. Greening attached in an email two documents outlining Eskom requirements for works at or near Eskom infrastructure.
Department of Agriculture, forestry & fisheries	N. V. Maumela Director: Land use and soil management	On 2 October 2015 Mr. Maumela attached in an email a letter that serves as a notice of receipt and confirms that the application has been captured in their electronic AgriLand tracking and management system. They strongly recommended that we use the on-line AgriLand application facility in future.
	Dr. M E. Tau Acting Deputy Director-General: Forestry and Natural Resources Management Delegate of the Minister	On 18 December 2015 Dr. Tau sent a letter informing that they have no objections against the proposed Grootpoort Photovoltaic Solar Power Plant on a portion measuring approximately 250 hectares, but indicated that a number of conditions apply.
Department of Water and Sanitation	Mr. W. Grobler Deputy Director: Water	On 6 November 2015 Mr. Grobler attached in an email a letter acknowledging the receipt of the Scoping Report for the Grootpoort Photovoltaic Solar Energy Facility near Luckhoff in the Free State. And indicated which Water Uses need to be

	Regulation	applied for under Section 21
	Dr. T. Ntili Provincial Head: Free State	<p>On 11 November 2015 Dr. Ntili issued a Non-Binding Confirmation of water availability for the proposed Grootpoort Photovoltaic Solar Energy Facility on Portion 1 of the Farm Grootpoort 168. Fauresmith District.</p> <p>He indicated that even though a non-binding confirmation of water availability is made at this stage, it is not a guarantee that water will be available is Pele Green is appointed as a preferred bidder since the bidder might be competing with other preferred bidders for the same water allocation.</p> <p>He also indicated that if the project were to receive preferred bidder status, then a WULA will be submitted, processed and considered for approval by the Minister's delegated official.</p>
	Mr. Mchunu Dumisani	<p>In an email dated 23 March 2016, Mr. Dumisani indicated that the Department does not have access to Dropbox and that a hard copy should be sent to the following address:</p> <p>Dr. T. Ntili Department of Water Affairs 2nd Floor Bloem Plaza Building Cnr Charlotte Maxeke and East Burger Street Bloemfontein 9300</p>
	Mr. Mchunu Dumisani	<p>In an email dated 12 April 2016, Mr. Dumisani attached the comments on the Environmental Impact Assessment for the Grootpoort Photovoltaic Solar Energy Facility near Luckhoff in the Free State Province:</p> <p>In the attached letter the Department of Water and Sanitation (DWS) acknowledged the receipt of the above mentioned report.</p> <p>The department stated that it was indicated in the report that there will be water used in the project. They indicated that if surface or ground water will be used it should be noted that it should not be used in a manner that will compromise downstream users. If the Municipal water will be used, other users especially domestic users must not be compromised.</p> <p>The DWS indicated that they have no further comments to the application mentioned, however the requirements and conditions in their previous correspondence are still valid. The comments were dated 6/11/2015 with the reference number</p>

		<p>16/2/7/D330/D5.</p> <p>They also stated that any further correspondence should be sent to their offices.</p>
Letsemeng Local Municipality	Mr. B. B. Mnguni Municipal Manager	<p>On 16 February 2016, the Letsemeng Local Municipality confirmed that they would not be able to remove the construction solid waste or general household waste to the nearest landfill site and that the Luckhoff landfill site has the capacity to accommodate waste from the construction and operational phases of the project, but the landfill site is not yet registered. The Municipality will however be able to remove sewerage from septic tanks during the construction and operational phase of the project for a fee.</p> <p>The municipality indicated that they would not be able to provide the solar power plant with water during either the construction – or operational phase of the project as the existing plant is underperforming and does not meet the current demands of the community. Only after the plant has been upgraded will the municipality be able to supply the project with water during both phases. And if possible the water will be delivered by truck.</p> <p>The municipality also indicated that they require documentation for approval of the building plans of the site.</p>

5.3 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT

The following sections provide general information on the biophysical and socio-economic attributes associated with the preferred development footprint.

5.3.1 Biophysical environment

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

5.3.1.1 Geology and soils

According to Mucina and Rutherford (2006) the site is located in an area underlain by shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation as well as Dwyka Group diamictites. Jurassic Karoo Dolerite sills and sheets support the vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms. Signs of erosion are visible in

the surrounding area and therefore the potential for erosion on the site should be investigated.

The area of investigation is located on sediments belonging to the Tierberg Formation, Ecca Group, Karoo supergroup and was deposited during the Paleozoic era. The Tierberg Formation is an argillaceous succession comprising almost entirely of dark blue-grey, laminated shale, rhythmically bedded shale and siltstone with a few thin layers of dark grey sandstone. Lenticular bodies of carbonate-rich rocks and nodules of limestone displaying cone-in cone structures are commonly encountered. Fish scales and sponge structures may be present in the carbonate-rich material.

The soil profile in the area consists of arenosols. Due to climatic conditions weathering of bedrock is limited hence the soil profile is of limited depth. The parent material of these arenosols is the reddish Aeolian sands of the Gordonia Formation, Kalahari Group. The modules of compressibility in the saturated state is greater than at natural moisture content, therefore the soil matrix can be regarded as collapsible. The angle of internal friction is between 32° and 38°. Differential settlement of these soils is critical for shallow foundations. The density of the sand usually increases with depth and some sandy subsoils may be very dense.

According to the Geotechnical Assessment (Appendix H1) based on the available geotechnical information a fatal flaw cannot be identified that may prematurely terminate the development of the proposed solar farm. Issues that may be of concern are the collapsing properties of the surface sands and hard rock excavation. However, the former issue can be designed for, and the latter issue can be addressed by the proper documentation prior to construction.

Based on the result of the desk study the planning of the facility may continue. However, it is essential that a full scale geotechnical investigation be conducted prior to construction of the facility. Such an investigation shall highlight the founding conditions, materials utilisation and soil corrossivity.

5.3.1.2 Site Hydrology

According to the Hydrology Impact Assessment (Appendix H3) The contours slope from RL 1220 on the south-west border to RL 1180 on the north-eastern border. A possible flood drainage channel exists as indicated on Figure 11. However, the area draining to the possible channel is too small to yield a flood peak which may form a flood line situation. No other prominent channel areas exist.

The catchment area draining into the possible flood channel is 0,175 km² and with a 1:100 year rainfall intensity of 98 mm/hour and a time of concentration of 21,4 minutes, the maximum flow from this small catchment will be 1,9 m³/s. With Manning`s n = 0,025 and Q₁₀₀ = 1,9 m³/s the flow velocity in this erosion channel will be 0,66 m/s and the flow depth will be 1,3 m. This means that the 1:100 year flood will be contained within the existing erosion channel and now flood lines will be formed.

The catchment area has no defined stream section and therefore sheet-flow or overland flow will be the flow pattern during a rainstorm.

The PV stands can be erected provided the foundations of the stands are designed to withstand the drag forces which results in water flowing past a partly or wholly immersed body (legs of PV stands in this case) exerts a force on the body, the component of which in the direction of the flow is known as the drag force. The drag force exerted by the flood water on the legs of the PV stands is a function of the depth of flow, the flow velocity raised to the power of two as well as the density of water. These calculations, Energy Dissipation Structures, Flood Retention Ponds and Stormwater Canals are included in Appendix H3.

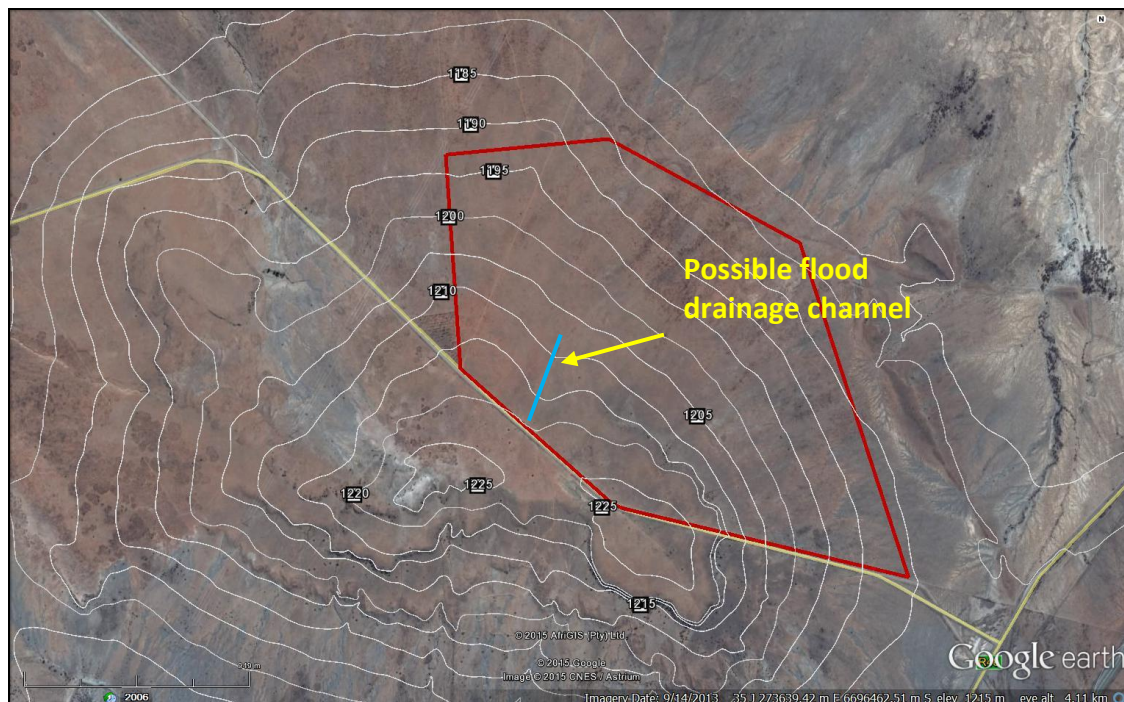


Figure 11: Contours of the site.

5.3.1.3 Vegetation and landscape features

In terms of vegetation type the site falls within the Northern Upper Karoo vegetation type, which is described by Mucina and Rutherford (2006) as 'least threatened'. The Northern Upper Karoo vegetation covers parts of the Northern Cape and Free State. The region is characterised by shrubland dominated by dwarf karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens* and some other low trees. The landscape is flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast.

The landscape of Portion 1 of the farm Groopport 168 is flat and open with a long hill along the western perimeter of the site. It is located between 1236mamsl and 1184mamsl. Slope across the land is from the west towards the northeast and southeast between 3.5% and 4.0%. There are no defined water courses on site. Drainage takes place by surface sheetwash and infiltration. Sheetwash ends up in a non-perennial stream located to the east of the site. The stream feeds into the orange River located to the south of the site.

The Northern Upper Karoo is classified as Least threatened with a target conservation of 21%. None of this vegetation type is currently conserved in statutory conservation areas and about 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams (Houwater, Kalkfontein and Smart Syndicate Dams). Areas of human settlements are increasing in the northeastern part of this vegetation type (Mucina & Rutherford, 2006). Erosion is moderate (46.2%), very low (32%) and low (20%). *Prosopis glandulosa*, regarded as one of the 12 agriculturally most important invasive alien plants in South Africa, is widely distributed in this vegetation type (Mucina & Rutherford, 2006). *Prosopis* occurs in generally isolated patches, with densities ranging from very scattered to medium (associated with the lower Vaal River drainage system and the confluence with the Orange River) to localised closed woodland on the western border of the unit with Bushmanland Basin Shrubland. (Mucina & Rutherford, 2006).

Flora assessments were conducted during the wet season (November - December 2015) although, due to the drought, very dry conditions persisted during the study. The areas of vegetation communities are summarised in Table 5.2 and named according to features such as dominant species, vegetation physiognomy and underlying substrate. Naming of the vegetation communities was made difficult due to the poor vegetation cover, during the dry season, and inability to identify dominant species with any confidence. Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, four main communities were recognised. It must be noted that these vegetation communities may be regarded as subcommunities in some instances (as many of the dominant species are dominant throughout the study area), but due to the homogeneity of the karroid vegetation it was decided, for the purposes of this study, to describe them as separate vegetation communities. Based on the nomenclature system described above the vegetation species are:

- *Chrysocoma* – *Aristida* plains dwarf shrubland;
- *Acacia* – *Chrysocoma* Plains Shrubland;
- *Acacia* – *Aristida* Wash Shrubland; and
- *Lycium* – *Crysocoma* Hillside Shrubland.

Table 5.2: Areas of vegetation communities at the Grootpoort study area

Vegetation Community	Area in ha	% of total study area
<i>Chrysocoma</i> – <i>Aristida</i> plains dwarf shrubland	131	59%
<i>Acacia</i> – <i>Chrysocoma</i> Plains Shrubland	56	25%
<i>Acacia</i> – <i>Aristida</i> Wash Shrubland	19	9%
<i>Lycium</i> – <i>Crysocoma</i> Hillside Shrubland	17	8%
Total	223	100%

A list of plant species previously recorded in the quarter degree grid in which the study area is situated was obtained from the South African National Biodiversity Institute. Additional species that could occur in similar habitats, as determined from official database searches

and reviewed literature, but not recorded in these grids are also listed. A total of 44 species were determined to possibly be occurring in the study area.

It is unlikely that any of these species occur on site but due to the very dry conditions occurring due to the drought this could not be confirmed, particularly with emergent species. It is suggested that the environmental control officer on site monitors ground clearing for any of these species

5.3.1.4 Climate

In the western part of its area this unit experiences the same climate as the Western Upper Karoo. In the eastern part the climate is very close to that of Karoo Escarpment. The MAP ranges from about 150 mm in the northwest to 350 mm along some grassland margins on the Great Escarpment and in the east. Water concentrates between rocks as a result of rainfall runoff. Incidence of frost is relatively high, but ranging widely from <30 days per year at lower altitudes to >80 days at highest altitudes (Mucina & Rutherford, 2006).

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, an increase of size of the solar farm may not affect the temperature of the surroundings.

5.3.1.5 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.

5.3.1.5.1 Avifaunal

This report is based on a desk-top review of documented information as well as on field observations during two surveys, totalling six days, one in the dry, and the other in the late “wet” season. The broader area is likely to have populations of some 200 species of birds. Only one red data species was observed.

The site proposed for the SPP is flat to gently sloping. The vegetation is low and sparse karoo scrub which is the primary regional vegetation. This scrub provides few resources for birds and the numbers and diversity of birds are naturally low. The situation during the two survey periods was of extremely dry conditions following three years of below average rainfall. As a result, both the number and diversity of birds was lower than usual and declined even further between the first and second surveys.

The main effect of an SPP development is destruction of habitat and consequent displacement of birds. The resident, and so primarily affected, bird species all have wide ranges. None are considered threatened. There are extensive areas of similar habitat in areas adjacent to the proposed SPP into which the displaced birds can move. Due to the low productivity of the affected habitats the number of individuals per concerned species is small and the overall effect of bird displacement is considered negligible.

It is likely that threatened (red listed) species may sometimes occur on or over the site in its current natural condition. In the absence of any particular feature to attract them, these species will be, at most, only transient users of the area to be developed. Thus the development of the proposed SPP will have no marked effect on red-listed species. The species most likely to be negatively impacted is the Northern Black Korhaan. These korhaans are ground foragers and both feed and breed in local habitat, including that to be developed. The population that may be displaced is minimal, 2-3 pairs at most. Disturbance during construction may deter birds from breeding in adjacent habitat.

A feature of potential concern is the possibility that polarized light from the PV panels, which at night gives the impression that there is a waterbody, may cause night-flying waterbirds to descend and die from collision with the structures. It is recommended that bird monitoring is carried out through the first year of the post-construction phase.

Development of the SPP is likely to produce a range of short-term and acute impacts on birds during construction as well as longer-term, chronic, impacts in the operational period. These impacts are mainly features that will also, to varying extent, degrade habitats adjacent to the developed area. A number of mitigation measures are suggested that will serve to reduce the effects of these impacts.

The conclusion of this scoping report is that, provided the indicated mitigations are followed, the impacts of the proposed development on local bird populations are of an acceptable level.

Monitoring

The bird faunas of this part of South Africa are poorly known and especially for the area that includes the Grootpoort property. It is unwise to base decisions solely on the six days of bird observations all made following an unusually hot, dry period.

It should be a requirement for development of the Grootpoort SEF that impacts on birds be appraised by regular monitoring. This monitoring should be continued over at least two years of operation as time is needed for plant life to re-develop and bird use of the area will increase as the plants grow. Surveys of bird presence, especially for collision victims, should be conducted over a few days in at least each summer and winter period. These surveys should be performed according to a protocol drawn up by a supervising bird specialist who should write annual reports. These reports will provide information for any further development at this proposed site and usefully provide information for the appraisal of the anticipated other solar array proposals in southern Africa.

5.3.1.5.2 Ecological

The Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) lists the possible presence or absence of threatened mammals, birds, reptiles, amphibians and butterflies and concludes that no threatened species are likely to be present at the site.

Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, four main communities were recognised. It must be noted that these vegetation communities may be regarded as sub-communities in some instances (as many of the dominant species are dominant throughout the study area), but due to the homogeneity of the karroid vegetation it was decided, for the purposes of this study, to describe them as separate vegetation communities. Based on the nomenclature system described above the vegetation species are:

- Chrysocoma – Aristida plains dwarf shrubland;
- Acacia – Chrysocoma Plains Shrubland;
- Acacia – Aristida Wash Shrubland; and
- Lycium – Chrysocoma Hillside Shrubland.

A total of 44 species were determined to possibly be occurring in the study area. The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability and most of these species have a low probability of occurrence in the study area and none were found to occur in the study area during the 2015 study.

The quantity and quality of floristic data for the study area is poor. There are few taxonomic collections and relatively little floristic information for the area. Reptile diversity in the area is high with approximately 47 reptile species occurring in the area and reptile endemism is especially high in the region with 21 species (42%) being endemic. Five were confirmed during the site visit). The number of species would certainly have been higher if the survey had been conducted during the summer months, especially after good rains. The three Red Data reptiles which may occur on the study site are discussed below. No exotic herpetofauna species are expected to occur on the study site.

Only ten amphibian species are expected to occur in the study area, and during the study no amphibian species were recorded.

Of the 53 mammal species expected to occur in the study area, according to historic recordings, only 12 were confirmed during the site visit.

Of the 15 species of concern that may occur in the study area, all have a low or very low probability of occurrence on site and none were recorded during the 2015 study.

The ecological function of the study area can generally be described as moderate for the majority of the study area, although this does vary from low (in the highly transformed areas due to overgrazing) to high in the more inaccessible or utilisable areas. Areas in which overgrazing and clearing have taken place, as well as areas in which settlements have been established are considered as areas where ecological function is reduced.

Areas that have been disturbed by farming are considered of moderate conservation importance due to the fact that rehabilitation of these areas is possible. The natural areas are considered of high conservation importance due to the presence of Red Data species in

these areas and the intrinsic importance of these areas. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.

Seven probable impacts, associated with the proposed project, on the ecology were identified during the study. All the impacts showed a low to moderate impact on the ecology of the area before mitigation, and all impacts are mitigable to some degree.

5.3.1.5.3 Visual landscape

The visual impact of photovoltaic facility depends on the complex relationship between the visual environment (landscape), the development (object), and the observer/receptor (e.g. farmer). The establishment of a solar facility on the site is not expected to have a significant visual effect, given that the number of sensitive receptors is very low, electrical infrastructure such as power lines are already located in close proximity to the site and the technology considered for this development will be non-reflective. However due to the extent of the proposed development (~250 hectares) a visual impact study is being conducted to determine to what extent the proposed development will be visible to observers and whether the landscape provides any significant visual absorption capacity.

Landform and drainage

According to the Visual Impact Assessment (attached as Appendix H5) The proposed development is located in an area with a large significance in elevation features including ridgelines, koppies and drainage. The site's highest elevation is located at approximately 1233m above mean sea level (amsl) at the southern border and 1184m amsl at the north eastern border, with a difference of 48m amsl. The site is located approximately 6km north of the Orange River with the river's amsl of 1116m. The site is also located approximately 4km south of the Lemoenspruit river with the river's amsl at 1141m. The connection point for the 132kV power line at Canal Substation has an amsl of 1155m and is located 3,3km east from the Orange River. The nearest town, Luckhoff, is located approximately 14km north east from the proposed development behind a koppie the locals call Kalwerkop. The koppie has an approximate amsl of 1300m resulting in no line of site from town to the proposed development.

Landscape Character Assessment Summary

The industrial development is unlikely to be sensitive to the proposed development, although the existing Eskom power infrastructure and irrigation infrastructure will provide a certain level of absorption capacity. The towns of Luckhoff, Orania and Van Der Kloof will not be sensitive to the proposed development largely due to distance and existing screening. Regarding service development, the proposed development will be visible momentarily from the R48 provincial road and the gravel roads, and will have a low impact on the passing passengers of vehicles. The majority of the affected area falls within the agricultural development area. A small amount of nearby farmsteads will be affected for the duration of the construction period and lifespan of the development.

Conclusion

The proposed development is located in a close proximity of existing Eskom power line infrastructure and agricultural infrastructure and might have a cumulative impact on viewers.

In terms of possible landscape degradation, the landscape does not appear to have any specific protection or importance although rural areas are clearly defined particularly from a distance and it is assumed that the majority of people would prefer rural views over views of heavy industrial development.

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 it is suggested that the development commence, from a visual impact point of view.

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 study area surrounding the proposed project site is located within the Letsemeng Local Municipality. The Letsemeng Municipality is part of the greater Xhariep District of the Free State. The district comprises another three municipalities.

The proposed PV Facility is located within the Letsemeng Municipality of the Free State Province of South Africa. The Free State is with a population of around 2.6 mil and a total area of 129 825 square kilometres, the third largest province in the country. The Province comprises four District Municipalities: Xhariep, Thabo Mofutsanyana, Fezile Dabi and Lejweleputswa District Municipality. The Mangaung Metropolitan Area also belongs to the Free State Province.

Poverty and health in the Free State:

The proposed PV Facility is located within the Letsemeng Municipality of the Free State Province of South Africa. The Free State is with a population of around 2.6 mil and a total area of 129 825 square kilometres, the third largest province in the country. The Province comprises four District Municipalities: Xhariep, Thabo Mofutsanyana, Fezile Dabi and Lejweleputswa District Municipality. The Mangaung Metropolitan Area also belongs to the Free State Province.

Education and Health in the Free State:

The Free State education data reflects trends in respect of literacy, learner educator ratio, school attendance and graduation.

The literacy rate in the Free State lies at 80 in 2010, which is a clear improvement from 64% in 1994. The Free State has seen farming schools close in the past years. The learner educator ratio however has remained below the national average (27.6 compared with 30.3

in 2011) (School Realities cited in Overview of Provincial Revenue and Expenditure, 2012/13). It is further reported that the majority of learners attends school, while the proportion has slightly decreased from 92.5 to 90.9% (Stats SA, Community Survey, 2007 cited in Overview of Provincial Revenue and Expenditure, 2012/13). More learners are passing Grade 12. The rate improved from 70.7% in 2010 to 75.7% in 2011. However, the quality of education is questioned.

Health indicators include child mortality, life expectancy and HIV prevalence. The infant mortality rate in the Free State is above the national average. Child mortality therefore remains a challenge even though the Province managed to reduce the rate by 33.3% over the past eight years.

Poverty and Unemployment in the Letsemeng Local Municipality:

Poverty in the Free State has declined, as it has nationally, between 2002 and 2010. In the Free State, the percentage of people living in poverty fell from 45.2% in 2006 down to 39.7% in 2010. The increased level of service provision is stated as driver of this change (Overview of Provincial Revenue and Expenditure, 2012/13).

According to the IDP 2014/15, the unemployment across Letsemeng averages at 22.3% (expanded definition). The highest unemployment figures are found in Luckhoff. Household income is low, with 10.2 of households within the “no Income” category, 7.4% have less than R10 000 and 23.9% annually less than R19 601.

5.3.2.2 Cultural and heritage aspects

The Orange River and its tributaries are well known for its river gravels, in some places containing large amounts of Early Stone Age tools (Acheullian) (Sampson 1972). The larger region also produced what was to become the Fauresmith industry, first identified by Van Riet Lowe. The Fauresmith is regarded to represent a transitional phase between the ESA and MSA, and have some technological and typological elements of the latter. There is a tendency towards smaller tools and small hand-axes in particular seem to a characteristic feature of the Fauresmith. Assemblages include refined hand-axes, long blades, convergent flakes/points, scrapers and prepared cores used in the manufacture of these tool types. This combination of Modes 2 and 3 makes it a likely transitional industry (Barham & Mitchell 2008:229).

A number of rock engraving sites dating to the Later Stone Age as well as the historic period are known to exist in the larger region, especially in the region on the eastern side of the Riet River. In the latter case, people riding horse are depicted. Many of these engravings from different sites have been removed and are “exhibited” in the town of Koffiefontein.

As yet, no sites dating to the Early Iron Age have been reported from the region and most sites date to the Late Iron Age. A number of stone walled settlement sites, classified by Maggs (1976) as type R ruins, occur north and south of the study area. These sites represent a transitional phase between Khoi herders settling permanently and Iron Age Tswana-speaking people entering the area. These settlements were first described by William Burchell during the first two decades of the 19th century. A large number of graves, located in close vicinity to the Riet River, have been archaeologically investigated (Humphreys 1970,

1997, 2009; Morris 1992; Ouzman 2001). Table 5.3 presents a summary of all the identified heritage resources in the area.

The town of Luckhoff was established in 1892 and named after the Reverend H J Luckhoff (1842 – 1943). Like Fauresmith, sheep farming is the backbone of the town economy. The Van der Kloof Dam, originally named the P.K. le Roux Dam, was completed 1977, is located approximately 30km south of the study region.

Table 5.3: Summary of identified heritage resources in the area

Identified heritage resources			
General protection (NHRA)	Coordinates		Description
Archaeological sites or material (Middle Stone Age Tools) (Section 35)	S 29.83426 S 29.84508	E 24.66112 E 24.65791	Two localised areas, associated with small outcrops, where thin scatters of MSA tools and flakes were identified. The density of the material is approximately 1 artefact/flake per 10m ² . The material used for the tools are hardened shale and lideanite.

According to the Paleaontological Heritage Assessment, (refer to Appendix H9) the fossil heritage within each of the major sedimentary rock units that are represented within the Grootpoort study area has been summarized in previous desktop and field-based palaeontological studies by the author (e.g. Almond 2013b, 2015). The dolerite outcrops in the study area are in themselves of no palaeontological significance. These are high temperature igneous rocks emplaced at depth within the Earth's crust so they do not contain fossils.

No significant further impacts on fossil heritage are anticipated during the planning, operational and decommissioning phases of the solar energy facility. The no-go alternative (i.e. no development) will have a neutral impact on palaeontological heritage.

There are no fatal flaws in the Grootpoort Photovoltaic Solar Energy Facility development proposal as far as fossil heritage is concerned. Providing that the proposed recommendations for palaeontological monitoring and mitigation outlined below are followed through, there are no objections on palaeontological heritage grounds to authorisation of this alternative energy project.

Due to the generally low levels of bedrock exposure within the study area as well as the lack of palaeontological field data from the study area, confidence levels for this palaeontological heritage assessment are only moderate. These conclusions are supported, however, by a previous palaeontological field assessment undertaken in the broader study region by the author (Almond 2015).

From a heritage point of view, the following condition will apply:

- To address any subsurface cultural or heritage resources it needs to be clearly stated in the construction environmental management plan, submitted with the EIA report, that SAHRA will be informed immediately should any artefacts be exposed during construction. Training of contractors on heritage issues will also form part of the contractor's brief.

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 aims 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, which will be submitted as part of the Environmental Impact Report in order to address the potentially most significant impacts.

6.1.1 Checklist analysis

The independent consultant conducted a site visit on 24 February 2015. 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	X			A possible flood drainage area exists on site.
II. A conservation or open space area		X		None.
III. An area that is of cultural importance		X		None.
IV. Site of geological significance	X			Signs of erosion are visible in the area. Therefore, special attention will be paid to mitigating potential erosion impacts on the site.
V. Areas of outstanding natural beauty		X		None.
VI. Highly productive agricultural land		X		None.

VII. Floodplain		×		None.
VIII. Indigenous forest		×		None.
IX. Grass land		×		None.
X. Bird nesting sites		×		None.
XI. Red data species			×	At least 9 bird species of conservation priority – red data- listing have been recorded in the QDS (Quarter Degree Square). It is possible that most of these may occur at or over the Grootpoort site.
XII. Tourist resort		×		None.
2. Will the project potentially result in potential?				
I. Removal of people		×		None.
II. Visual Impacts	×			The visual impact of a low-lying PV facility is not expected to be significant as the number of sensitive receptors in the area is very low. However, a visual impact study will be conducted.
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 a local gravel road of the R48.
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 300 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 10 000m ³ per annum.
VIII. Job creation	×			Approximately 350 employment opportunities will be created during the construction and operational phases.
IX. Traffic generation		×		None.

X. Soil erosion	×			The site will need to be cleared or graded to a limited extent, which may potentially result in a degree of dust being created, increased runoff and potentially soil erosion. The time that these areas are left bare will be limited to the construction phase, since vegetation will be allowed to grow back after construction.
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	×			Non-perennial streams are located in close proximity to the site.
II. A conservation or open space area		×		None.
III. An area that is of cultural importance		×		None.
IV. A site of geological significance	×			Signs of erosion are visible in the area. Therefore, special attention will be paid to mitigating potential erosion impacts on the site.
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 the mitigation of the potential impacts. The matrix also highlights areas of particular concern (see Table 6.2), which requires more in depth assessment (refer to section 6.7). An indication is also provided of the specialist studies which were conducted. Each cell is evaluated individually in terms of the nature of the impact, duration and its significance – should no mitigation measures be applied. This is important since many impacts would not be considered insignificant if proper mitigation measures were implemented. The matrix also provides an indication if mitigation measures are available.

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

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

Table 6.2: Matrix analysis

LISTED ACTIVITY (The Stressor)	ASPECTS OF THE DEVELOPMENT /ACTIVITY	POTENTIAL IMPACTS		SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS							MITIGATION OF POTENTIAL IMPACTS			SPECIALIST STUDIES / INFORMATION					
		Receptors	Impact description / consequence	Minor	Major	Extent	Duration	Probability	Reversibility	Irreplaceable loss of resources	Possible Mitigation	Possible mitigation measures	Level of residual risk						
CONSTRUCTION PHASE																			
<p><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.”</p> <p><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.”</p> <p><u>Activity 12(Regulation 983):</u> “The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse or (c) ...within 32 metres of a watercourse, measured from the edge of a watercourse.”</p> <p><u>Activity 19 (Regulation 983):</u> “The infilling or depositing of any material of more than 5</p>	<p><u>Site clearing and preparation</u> Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled.</p> <p><u>Civil works</u> The main civil works are:</p> <ul style="list-style-type: none"> • 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 where reasonably possible. Additionally, the turning circle for trucks will also be taken into consideration. • Trenching – all Direct Current (DC) and Alternating Current (AC) 	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> • Loss or fragmentation of indigenous natural vegetation. • Loss of sensitive species. • Loss or fragmentation of habitats. 	-	-	-	-	-	-	-	-	-	Yes	<ul style="list-style-type: none"> - 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		
			Air	<ul style="list-style-type: none"> • Air pollution due to the increase of traffic of construction vehicles. 	-	-	-	-	-	-	-	-	-	-	-	Yes	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> • Soil degradation, including erosion. 	-	-	-	-	-	-	-	-	-	-	-	-	Yes	<ul style="list-style-type: none"> - Areas which are not to be constructed on within two months must not be 	M

<p>cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse..."</p> <p><u>Activity 15 (Regulation 984):</u> "The clearance of an area of 20 hectare or more of indigenous vegetation..."</p>	<p>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.</p> <p><u>Transportation and installation of PV panels into an Array</u> The panels are assembled at the supplier's premises and will be transported from the factory to the site on trucks. The panels will be mounted on metal structures which are fixed into the ground either through a concrete foundation or a deep seated screw.</p> <p><u>Wiring to the Central Inverters</u> Sections of the PV array would be wired to central inverters which have a maximum rated power of 2000kW each. The inverter is a pulse width mode inverter that converts DC electricity to alternating electricity (AC) at grid frequency.</p>			<ul style="list-style-type: none"> Disturbance of soils and existing land use (soil compaction). Physical and chemical degradation of the soils by construction vehicles (hydrocarbon spills). Loss of topsoil. 								<p>cleared to reduce erosion risks.</p> <p>- The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.</p> <p>- Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc.</p>		Agricultural Potential Study	
		Geology	<ul style="list-style-type: none"> 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 ground. Instability due to soluble rock. Steep slopes or areas of unstable natural slopes. Areas subject to seismic activity. Areas subject to flooding. 									Yes	<p>- 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.</p> <p>- If an activity will mechanically disturb below surface in any way, then any available topsoil should first be stripped from the entire surface and stockpiled for re-spreading during rehabilitation.</p> <p>- Retention of vegetation where possible to avoid soil erosion.</p>	L	Geotechnical Study
		Existing services infrastructure	<ul style="list-style-type: none"> Generation of waste that need to be accommodated at a licensed landfill site. Generation of sewage that 										Yes	-	L

				<ul style="list-style-type: none"> need to be accommodated by the local sewage plant. Increase in construction vehicles on existing roads. 														
			Ground water	<ul style="list-style-type: none"> Pollution due to construction vehicles. 	-		S	S	Pr	CR	ML	Yes	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> Increase in storm water run-off. Pollution of water sources due to soil erosion. Destruction of watercourses (non-perennial streams/drainage lines). 			L	S	Pr	PR	ML	Yes	<ul style="list-style-type: none"> - 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 20m from 	M	Hydrological study			

													any of the water bodies on site.			
			Local unemployment rate	<ul style="list-style-type: none"> Job creation. Business opportunities. Skills development. 									Yes	- Where reasonable and practical, Pele Green'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	<ul style="list-style-type: none"> Potential visual impact on residents of farmsteads and motorists in close proximity to proposed facility. 	-								Yes	-	L	-
			Traffic volumes	<ul style="list-style-type: none"> Increase in construction vehicles. 	-								Yes	-	L	-
			Health & Safety	<ul style="list-style-type: none"> 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. 									Yes	<ul style="list-style-type: none"> 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 	M	Social Impact Assessment
			Noise levels	<ul style="list-style-type: none"> The generation of noise as a result of construction vehicles, the use of machinery such as drills and people working on the site. 	-								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,	L	-
		SOCIAL/ECONOMIC ENVIRONMENT														

																compressors, concrete mixers as well as vehicles should be kept in good operating order and where appropriate have effective exhaust mufflers.			
			Tourism industry	<ul style="list-style-type: none"> Since there are no tourism facilities in close proximity to the site, the proposed activities will not have an impact on tourism in the area. 	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Heritage resources	<ul style="list-style-type: none"> Removal or destruction of archaeological and/or paleontological sites. Removal or destruction of buildings, structures, places and equipment of cultural significance. Removal or destruction of graves, cemeteries and burial grounds. 		-	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 & Palaeontological Impact Assessment			
OPERATIONAL PHASE																			
	The key components of the proposed project are described below: <ul style="list-style-type: none"> <u>PV Panel Array</u> - To produce 100MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to 	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> Fragmentation of habitats. Establishment and spread of declared weeds and alien invader plants (operations). Impact on avifauna. 		-	P	L	Po	PR	ML	Yes	<ul style="list-style-type: none"> Indigenous vegetation must be maintained and all exotics removed as they appear and disposed off appropriately. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 	M		Ecological Fauna and Flora Habitat Survey & Avifaunal Study			

<p>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.</p> <ul style="list-style-type: none"> • <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 current (DC) electricity to alternating current (AC) electricity at grid frequency. • <u>Connection to the grid</u> - 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 Grootpoort Solar Power Plant has not yet received a cost estimate 												- Implement a Avifauna Monitoring plan.			
	Air quality	<ul style="list-style-type: none"> • 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	N/A	
	Soil	<ul style="list-style-type: none"> • Soil degradation, including erosion. • Disturbance of soils and existing land use (soil compaction). • Loss of agricultural potential (low significance relative to agricultural potential of the site). 										Yes	<ul style="list-style-type: none"> - 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. 	M	Soil, Land Capability and Agricultural Potential Study
	Geology	<ul style="list-style-type: none"> • 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. 										Yes	<ul style="list-style-type: none"> - Surface drainage should be provided to prevent water ponding. - Mitigation measures proposed by the detailed engineering geological investigation should be implemented. 	L	Geotechnical Study

<p>letter from Eskom, it is expected that generation from the facility will tie in with Canal Substation. Although the generation capacity is 100MW generation capacity at the point of connection with Eskom will be estimated at maximum of 75MW.</p> <ul style="list-style-type: none"> • <u>Supporting Infrastructure</u> - A control facility with basic services such as water and electricity will be constructed on the site and will have an approximate footprint 400m². Other supporting infrastructure includes voltage and current regulators and protection circuitry. • <u>Roads</u> – Access will be obtained via a local gravel road of the R48. An internal site road network will also be required to provide access to the solar field and associated infrastructure. All site roads will require a width of approximately 4m. • <u>Fencing</u> - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. 			<ul style="list-style-type: none"> • Areas subject to seismic activity. • Areas subject to flooding. 														
	Existing services infrastructure		<ul style="list-style-type: none"> • Generation of waste that need to be accommodated at a licensed landfill site. • Generation of sewage that need to be accommodated by the municipal sewerage system and the local sewage plant. • Increased consumption of water. Approximately 10 000 000 liters of water per annum will be required for the operation of the solar plant. 												<ul style="list-style-type: none"> - Waste has to be accommodated at a licensed landfill site. - Water saving devices will be implemented 	M	Confirmation from the Local Municipality
	Ground water		<ul style="list-style-type: none"> • 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		<ul style="list-style-type: none"> - All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should be securely banded (impermeable floor and sides) to prevent accidental discharge to groundwater. 	L	-		
	Surface water		<ul style="list-style-type: none"> • Increase in storm water runoff. The development will potentially result in an increase in storm water runoff that needs to be managed to prevent soil erosion. • Leakage of hazardous materials. The development will comprise of a distribution substation and will include transformer bays which will contain 			L	L	Pr	PR	ML	Yes	<ul style="list-style-type: none"> - 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	Hydrology Impact Assessment			

			transformer oils. Leakage of these oils can contaminate water supplies.														
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	<ul style="list-style-type: none"> • Destruction of watercourses (non-perennial streams). • 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. 													
			Visual landscape	<ul style="list-style-type: none"> • Change in land-use/sense of place. The site is characterized by open veldt with a rural agricultural sense of place. The use of the area for the construction and operation of the PV plant will result in the area not being used for livestock grazing anymore. • Potential visual impact on residents of farmsteads and travellers in close proximity to proposed facility. 													
			Traffic volumes	<ul style="list-style-type: none"> • The proposed development will not result in any traffic impacts during the operational phase. 													
			Health & Safety	<ul style="list-style-type: none"> • The proposed development will not result in any health and safety impacts during the operational phase. 													

			Noise levels	<ul style="list-style-type: none"> 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	N/A
			Tourism industry	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> It is not foreseen that the proposed activity will impact on heritage or Palaeontological resources or vice versa. 	-		S	L	Po	PR	ML	Yes	-	L	Heritage & Palaeontological Impact Assessment	
			Electricity supply	<ul style="list-style-type: none"> Generation of additional electricity. The facility will generate electricity that will be fed into the grid. 	+		I	L	D	I	N/A	Yes	-	N/A	-	
			Local community	<ul style="list-style-type: none"> The establishment of a Community Trust. 		+	L	L	Pr	I	N/A	Yes	- Pele Green, in consultation with the LLM, should investigate the options for the establishment of a Community Development Trust.	N/A	Social Impact Assessment	
			Electrical infrastructure	<ul style="list-style-type: none"> 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																
-	Dismantlement of infrastructure During the decommissioning phase the Solar PV Energy facility and its associated infrastructure will be dismantled.	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> 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	-	
	Rehabilitation of biophysical		Air quality	<ul style="list-style-type: none"> 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	L	-	

<u>environment</u> The biophysical environment will be rehabilitated.													emissions.		
	Soil	<ul style="list-style-type: none"> • 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). 											<ul style="list-style-type: none"> - Re-vegetation of affected areas must be made a priority to avoid erosion. 	M	-
	Geology	<ul style="list-style-type: none"> • 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	N/A	N/A
	Existing services infrastructure	<ul style="list-style-type: none"> • Generation of waste that need to be accommodated at a licensed landfill site. • Generation of sewage that need to be accommodated by the municipal sewerage system and the local sewage plant. • Increase in construction vehicles. 											<ul style="list-style-type: none"> - 	L	-
	Ground water	<ul style="list-style-type: none"> • Pollution due to construction vehicles. 											<ul style="list-style-type: none"> - 	L	-
	Surface water	<ul style="list-style-type: none"> • Increase in storm water run-off. • Pollution of water sources due to soil erosion. • Destruction of watercourses (non-perennial streams). 											<ul style="list-style-type: none"> - 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) 	M	-

															contamination.		
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	<ul style="list-style-type: none"> Loss of employment. 	-	L	L	Po	PR	NL	Yes	- Pele Green should ensure that retrenchment packages are provided for all staff retrenched when the facility is decommissioned.	M	Social Impact Assessment			
	Visual landscape		<ul style="list-style-type: none"> 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	-				
	Traffic volumes		<ul style="list-style-type: none"> 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 vehicles through residential areas should not take place over weekends.	L	-				
	Health & Safety		<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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. 	L	-				

													- 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.		
		Noise levels	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Since there are no tourism facilities in close proximity to the site, the decommissioning activities will not have an impact on tourism in the area. 	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A
		Heritage resources	<ul style="list-style-type: none"> 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	-

6.2 KEY ISSUES IDENTIFIED

From the above it is evident that mitigation measures are available for potential impacts associated with the proposed activity and development phases. The scoping methodology identified the following key issues which are addressed 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 1 (Regulation 984): *“The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.”*
- Activity 12(xii)(a)(c) (Regulation 984): *“The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse or (c) ...within 32 metres of a watercourse, measured from the edge of a watercourse.”*
- Activity 19(i) (Regulation 983): *“The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse...”*
- 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 streams), 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 streams), 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 result in the loss of permanent employment. However, skilled staff will be eminently employable and a number of temporary jobs will also be created in the process.

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.

Table 6.3: Aspects to be assessed

Aspects	Potential impacts	Description of the impact	Specialist studies / technical information
Construction of the PV Solar facility	<ul style="list-style-type: none"> Impacts on the fauna and flora 	Refer to table 6.2	Ecological Fauna and Flora Habitat Survey & Avifauna Study
	<ul style="list-style-type: none"> Impacts on agricultural potential (soils) 	Refer to table 6.2	Agricultural and Soils Impact Assessment
	<ul style="list-style-type: none"> Impacts associated with the geology of the site 	Refer to table 6.2	Geotechnical Assessment
	<ul style="list-style-type: none"> Impacts on existing services infrastructure 	Refer to table 6.2	Confirmation from the Local Municipality
	<ul style="list-style-type: none"> Impacts on surface water 	Refer to table 6.2	Hydrology Impact Assessment
	<ul style="list-style-type: none"> Temporary employment, impacts on health and safety 	Refer to table 6.2	Social Impact Assessment
	<ul style="list-style-type: none"> Impacts on heritage & Paleontological resources 	Refer to table 6.2	Heritage & Paleontological Impact Assessment
Operation of the PV Solar facility	<ul style="list-style-type: none"> Impacts on the fauna and flora 	Refer to table 6.2	Ecological Fauna and Flora Habitat Survey & Avifauna study
	<ul style="list-style-type: none"> Impacts on agricultural potential (soils) 	Refer to table 6.2	Agricultural and Soils Impact Assessment
	<ul style="list-style-type: none"> Impacts associated with the geology of the site 	Refer to table 6.2	Geotechnical Assessment

	<ul style="list-style-type: none"> Increased consumption of water 	Refer to table 6.2	EAP assessment
	<ul style="list-style-type: none"> Impacts on surface water 	Refer to table 6.2	Hydrology Impact Assessment
	<ul style="list-style-type: none"> Pressure on existing services infrastructure 	Refer to table 6.2	Confirmation from the Local Municipality
	<ul style="list-style-type: none"> Visual Impact 	Refer to table 6.2	Visual Impact Assessment
	<ul style="list-style-type: none"> Provision of employment & generation of income for the local community 	Refer to table 6.2	Social Impact Assessment
	<ul style="list-style-type: none"> Cumulative biophysical impacts resulting from similar developments in close proximity to the proposed activity. 	Refer to table 6.2	Social Impact Assessment
Decommissioning of the PV Solar facility	<ul style="list-style-type: none"> Impacts on agricultural potential (soil) 	Refer to table 6.2	Agricultural and Soils Impact Assessment
	<ul style="list-style-type: none"> Impacts on surface water 	Refer to table 6.2	Hydrology Impact Assessment
	<ul style="list-style-type: none"> Socio-economic impacts (loss of employment) 	Refer to table 6.2	Social Impact Assessment

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 Soilcraft CC (see Appendix H1).
- An Ecological Fauna and Flora Habitat Survey - conducted by Hydson Ecology (Pty) Ltd. (see Appendix H2).
- A Hydrology Impact Assessment – conducted by CWT (see Appendix H3).
- An Avifaunal Study – conducted by Dr Williams’ Bird Surveys (see Appendix H4)
- A Visual Impact Assessment - conducted by Phala Environmental Consultants (Pty) Ltd. (see Appendix H5).
- Soil, Land Capability and Agricultural Study – conducted by Environment Research Consulting (see Appendix H6).
- A Heritage Impact Assessment - conducted by Mr. J.A. van Schalkwyk (see Appendix H7).
- A Social Impact Assessment - conducted by Knowledge Pele (see Appendix H8).

- A detailed assessment of the cumulative impacts associated with the proposed development – conducted by the lead consultant, Environamics (refer to Section 5.12 of this report).

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

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 favorable for the development of a PV solar plant?”

According to the Geotechnical Assessment (Appendix H1) based on the available geotechnical information a fatal flaw cannot be identified that may prematurely terminate the development of the proposed solar farm. Issues that may be of concern are the collapsing properties of the surface sands and hard rock excavation. However, the former issue can be designed for, and the latter issue can be addressed by the proper documentation prior to construction.

Based on the result of the desk study the planning of the facility may continue. However, it is essential that a full scale geotechnical investigation be conducted prior to construction of the facility. Such an investigation shall highlight the founding conditions, materials utilisation and soil corrosivity.

6.4.2. Issue 2: Heritage, archeological and 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. 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, archeological or paleontological artifacts?”

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

The aim of the 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 cultural landscape qualities of the larger region essentially consist of two

components. The first is a rural area in which the human occupation is made up of a pre-colonial element (Stone Age) as well as a much later colonial (farmer) component.

Impact analysis of cultural heritage resources under threat of the proposed development, are based on the present understanding of the development:

- Two localised areas, associated with small outcrops, where thin scatters of MSA tools and flakes were identified.
- Both areas are located inside the proposed development area and would therefore be impacted on by the development. However, as the density of the scatter is very low, as well as the fact that it is surface material and therefore not in its original context any more, it is viewed to have a low significance and it is judged that the impact would be very low.

Reasoned opinion as to whether the proposed activity should be authorised:

From a heritage point of view, it is recommended that the proposed development be allowed to continue, on condition of acceptance of the proposed mitigation measures.

According to the Paleontological Impact Assessment (Appendix H9) No significant fossil heritage resources have been recorded within the Grootpoort Photovoltaic Solar Energy Facility study area. The area is inferred to be of low sensitivity in terms of palaeontological heritage and no sensitive or no-go areas have been identified within it during the present desktop assessment. The proposed solar energy facility is of LOW (negative) impact significance with respect to palaeontological heritage resources. Cumulative impacts associated with the Grootpoort Photovoltaic Solar Energy Facility are probably low. There are no fatal flaws in the Grootpoort Photovoltaic Solar Energy Facility development proposal as far as fossil heritage is concerned. The no-go alternative is of neutral significance for palaeontology. Providing that the recommendations outlined below for palaeontological monitoring and mitigation are followed through, there are no objections on palaeontological heritage grounds to authorisation of this alternative energy project.

Pending the potential discovery of significant new fossil remains during development - notably fossil vertebrate bones & teeth - no further specialist palaeontological studies or mitigation are considered necessary for this project.

6.4.3. Issue 3: Ecological Impacts

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

“How will the proposed development impact on the ecology?”

The Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) confirmed that:

The ecological function of the study area can generally be described as moderate for the majority of the study area, although this does vary from low (in the highly transformed areas due to overgrazing) to high in the more inaccessible or utilisable areas. Areas in which overgrazing and clearing have taken place, as well as areas in which settlements have been established are considered as areas where ecological function is reduced.

Areas that have been disturbed by farming are considered of moderate conservation importance due to the fact that rehabilitation of these areas is possible. The natural areas are considered of high conservation importance due to the presence of Red Data species in these areas and the intrinsic importance of these areas. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.

Seven probable impacts, associated with the proposed project, on the ecology were identified during the study. All the impacts showed a low to moderate impact on the ecology of the area before mitigation, and all impacts can be mitigated to some degree.

6.4.4 Issue 4: Avifaunal Impacts

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

“How will the proposed development impact on the avifauna?”

No birds of prey were observed across the four periods of observation. Neither the habitats, nor the local food resources, are likely to attract raptors other than on an irregular transient or casual basis. Specifically, there is no habitat on the Grootpoort site where raptors are likely to breed or even roost. The farmer stated that groups of un-specified small falcons sometimes occur. These are likely to be migrants which may occur seasonally after good rains when there is pronounced insect emergence.

A number of bird species endemic to South Africa may occur on the site. The only endemic species that was numerous was the Rufous-eared Warbler. This species is widespread in karoo scrub habitats. As locally and nationally there are very extensive areas of this habitat the loss of the small local population is not important.

Based on the observations of both habitat for birds and of birds species observed there is no reason to raise opposition, from an avifaunal perspective, to the proposed development of a solar array on the designated Grootpoort site. However, this is an intermediary conclusion. Only after the BirdLife-required second, late rainy season, period of observations –scheduled for March 2016 - will a final avifaunal conclusion be available.

6.4.5 Issue 5: Visual Impacts

Due to the extent of the proposed photovoltaic solar plant (250 hectares) it is expected that the plant will result in potential visual impacts. The main question which needs to be addressed is:

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

The Visual Impact Assessment (Refer to Appendix H5) concluded that the construction and operation of the Proposed Grootpoort PV Solar Energy Facility and its associated infrastructure will have a “Negative Medium” visual impact. The only receptors likely to be impacted by the proposed development are the nearby farmsteads, tourists visiting the surrounding areas, people travelling on the R48 provincial road and gravel roads. The proposed development is located in a close proximity of existing Eskom power line infrastructure and agricultural infrastructure and might have a cumulative impact on viewers.

In terms of possible landscape degradation, the landscape does not appear to have any specific protection or importance although rural areas are clearly defined particularly from a distance and it is assumed that the majority of people would prefer rural views over views of heavy industrial development.

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 it is suggested that the development commence, from a visual impact point of view.

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 Soil, Land Capability and Agricultural Study (refer to Appendix H6) there are four potential negative impacts on agricultural resources and productivity.

In the consideration of mitigation it is assumed that a high level of mitigation takes place but does not lead to prohibitive costs. It is evident that prior to mitigation all of the impacts range between high and low level impacts but with proper mitigation measures all impacts can be reduced to low level.

6.4.7 Issue 7: Socio-economic impacts

A Social Impact Assessment (refer to Appendix H8) 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. The main question which needs to be addressed is:

“How will the proposed development impact on the socio-economic environment?”

The findings of the Social Impact Assessment (refer to Appendix H8) indicate that The project represents an important development opportunity for the communities surrounding Grootpoort PV. Should it be approved, it will not only supply the national grid with much needed clean power, but will also achieve the following for social upliftment:

- Increase educational attainment of local youth through a bursary programme funded through SED.
- Increase the number of job-creating enterprises funded through ED.
- Improve key infrastructure identified by the community such as housing and roads.
- Increase the skills levels of local community.
- Lead to lasting economic development gains for the local community and province.

6.5 METHOD OF ENVIRONMENTAL ASSESSMENT

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

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 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.

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 EIR and for each impact a separate section has been added which discusses any cumulative issues, and where applicable, draws attention to other issues that may contextualise or add value to the interpretation of the impact. 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 120km radius surrounding the proposed development – refer to figure 12 below.



Figure 12: Geographic area of evaluation

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 120km would generally confine the potential for cumulative effects within this particular environmental landscape. The 120km radius is also the area within which most PV solar projects are located. This is also the approximate distance to the border of the Eastern Cape Province, where only one PV project has received preferred bidder status. The geographic area therefore includes projects located within the Free State and Northern Cape Provinces. A larger geographic area may be used to analyse cumulative impacts based on a resources' specific temporal or spatial impacts. For example, the socioeconomic cumulative analysis may include a larger area, as the construction workforce would 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 paid to 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 seven solar PV plant have been granted preferred bidders status within the geographic area of investigation – refer to figure 13 below. The following plants are currently fully operational:

- De Aar Solar Power with a capacity of 50MW near De Aar, Northern Cape Province;
- Kalkbult with a capacity of 72.5MW near De Aar, Northern Cape Province;
- Mulilo Renewable Energy Solar PV De Aar with a capacity of 9.7MW near De Aar, Northern Cape Province;
- Solar Capital De Aar 3 with a capacity of 75MW near De Aar, Northern Cape Province;
- Pulida Solar Park with a capacity of 75MW near Jakobsdal, Free State Province;
- Herbert Solar Park with a capacity of 19.9MW near Douglas, Northern Cape Province; and
- Greefspan Solar Park with a capacity of 10MW near Douglas, Northern Cape Province.

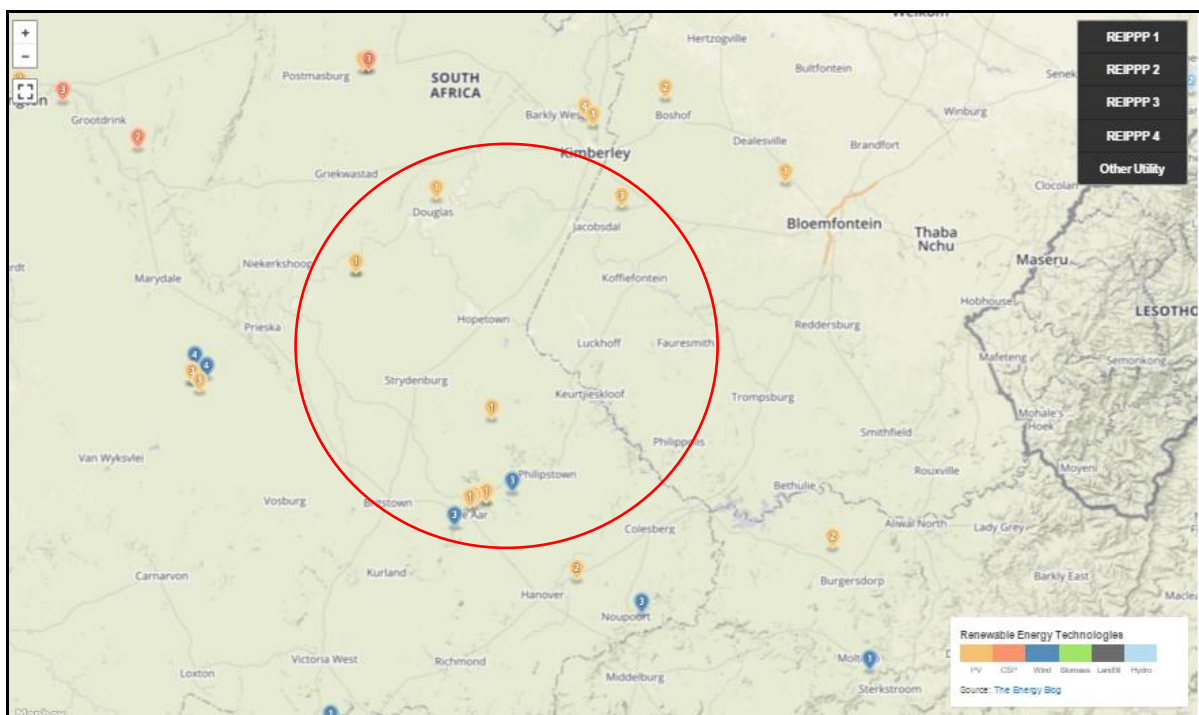


Figure 13: Utility-scale Renewable Energy Generation Sites

Two Wind Energy projects are also located within the area indicated above:

- Longyuan Mulilo De Aar 2 North Wind Energy Facility with a capacity of 139MW (construction); and

- Longyuan Mulilo De Aar Maanhaarberg Wind Energy Facility with a capacity of 96MW (awaiting construction – approved and financed).

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 on agriculture. Agriculture in the area is primarily associated with cattle grazing.

The major development activity in the general area is the development of PV Solar Projects. 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 application submitted within South Africa – refer to figure 14 below. According to this database approximately 28 applications have been submitted for renewable energy projects within the geographical area of investigation. The majority of these (~18) projects are located in close proximity to De Aar, which is more than 70km from the Grootpoort site.

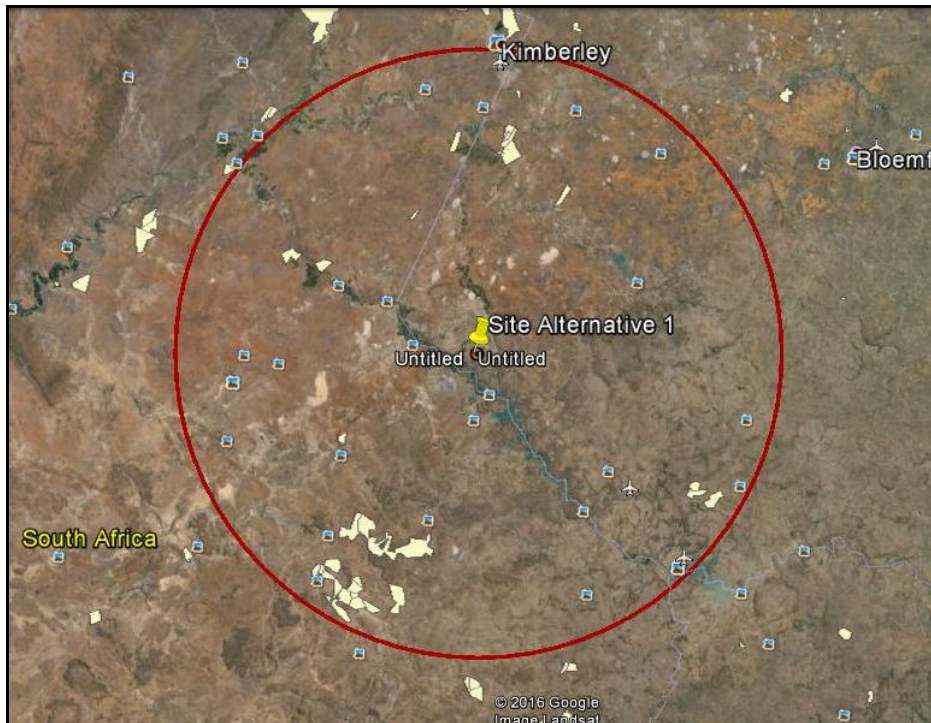


Figure 14: National Wind and Solar PV SEA: Renewable Energy EIA Application Received before Dec. 2012

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 local area. The following sections present their findings.

7.5.1 Geology

The desk top 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. Issues that may be of concern are the collapsing properties of the surface sands and hard rock excavation. However, the former issue can be designed for, and the latter issue can be addressed by proper documentation prior to construction.

7.5.2 Soil, Land Capability and Agricultural Potential

Four possible impacts on soil resulting from the proposed project are expected. These impacts are:

- Soil erosion due to increased run-off from the surfaces of the panels of the photovoltaic plant.
- Soil compaction caused by transport of equipment on and off site during construction and operation. This also includes transport during the operational phase to do maintenance work.
- Chemical soil pollution that may result from batteries being disposed of during the decommissioning phase as well as fuel and oil spills from vehicles transporting equipment.
- Change in current grazing land use.

The Soil, Land Capability and Agricultural Study (refer to Appendix H6) confirmed that these potential impacts will be localised within the site boundary area and that the measurable effect of the potential impacts may be reduced significantly with the proposed mitigation measures.

7.5.3 Hydrology

The Hydrology Impact Assessment (refer to Appendix H3) confirmed that the area draining to the possible erosion channel is too small to yield a flood peak which may form a flood line situation. With regards to flooding and deposition of silt the study confirmed that the soil can be classified as a sandy loam type and the grass cover is sparse with 50% soil not covered by grass. The site was divided into 5 areas where similar flow velocities can be expected. It was concluded that erosion may occur for certain rainfall intensities and that minimal silting is expected. Therefore, the cumulative effects with regards to soil erosion is considered to be of low significance.

7.5.4 Ecology

The Ecological Fauna and Flora Habitat Survey (refer to Appendix H2) confirmed that the ecological function of the study area can generally be described as moderate for the majority of the study area, although this does vary from low (in the highly transformed areas due to

overgrazing) to high in the more inaccessible or areas not suited for use. Areas in which overgrazing and clearing have taken place, as well as areas in which settlements have been established are considered as areas where ecological function is reduced. Seven probable impacts, associated with the proposed project, on the ecology were identified during the study. All the impacts showed a low to moderate impact on the ecology of the area before mitigation, and all impacts are able to be mitigated to some degree.

Of the 15 species of concern that may occur in the study area, all have a low or very low probability of occurrence on site and none were recorded during the 2015 study. Therefore, the cumulative impact of the proposed development is considered to be low.

7.5.5 Birds

The immediate, and most important, impact on birds of the development of solar arrays is transformation of the area through the destruction of all vegetation. This removes almost all resources for birds and forces them to leave the area.

It is generally assumed that birds occupy areas at a level close to carrying capacity in terms of current local resources. Birds that are displaced from the array area must then compete with birds already occupying the areas in which they try to relocate. Whether the displaced birds or the residents survive the result is likely to be mortality of individuals and a depletion of the local population of the affected species. In terms of numbers of individuals, the species most affected will be the smaller bodied species which have larger population densities. However, these are usually “commoner” and widespread species. Provided there are ample areas of suitable vegetation these species are of relatively low conservation concern. Only when the affected species has a small global, national, or in some instances provincial, distribution or has very specialised habitat requirements, is there conservation concern for these smaller birds. The effect of displacement is generally greater on the larger bodied species which require larger areas and so have lower overall populations. These larger birds are also generally being more impacted by wider human related activities – disturbance, hunting, collision with structures etc.

A total of 53 bird species were recorded during observations on 3 calendar days. The number of species recorded is low because of the very poor resource level of the area as a result of: 1) the limited habitat diversity; 2) low vegetation height; 3) the prolonged period of below average rainfall; and 4) the extremely hot conditions. In the designated area there is no critically important habitat for birds. The Grootpoort site usually has no resources attractive to threatened species either in terms of food or breeding places.

It was concluded that based on the observations of both habitats for birds and of bird’s species observed there is no reason to raise opposition, from an avifaunal perspective, to the proposed development of a solar array on the designated Grootpoort site. However, this is an intermediary conclusion. Only after the BirdLife-required second, late rainy season, period of observations –scheduled for March 2016 - will a final avifaunal conclusion be available. The final avifaunal study and EIR will be made available for comments in June 2016.

7.5.6 Social Impact Assessment

The Social Impact Assessment (refer to Appendix H8) concluded that the project represents an important development opportunity for the communities surrounding Grootpoort PV. Should it be approved, it will not only supply the national grid with much needed clean power, but will also provide a number of opportunities for social upliftment. The cumulative impacts for each of the potential social impacts were assessed throughout the report. The most significant cumulative social impacts are summarised in Table 7.1 below.

7.5.7 Visual

The Visual Impact Assessment (refer to Appendix H5) confirmed that the proposed development is located in a close proximity of existing Eskom power line infrastructure and agricultural infrastructure and might have a cumulative impact on viewers. In terms of possible landscape degradation, the landscape does not appear to have any specific protection or importance although rural areas are clearly defined particularly from a distance and it is assumed that the majority of people would prefer rural views over views of heavy industrial development. However, 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 it is suggested that the development commence, from a visual impact point of view.

7.5.8 Heritage

The Heritage Impact Assessment (refer to Appendix H7) confirmed that two localised areas, associated with small outcrops, where thin scatters of MSA tools and flakes were identified. Both areas are located inside the proposed development area and would therefore be impacted on by the development. However, as the density of the scatter is very low, as well as the fact that it is surface material and therefore not in its original context any more, it is viewed to have a low significance and it is judged that the impact would be very low. Due to its low significance, the potential for cumulative impact is also considered to be minimal. The Palaeontological Impact Assessment (Appendix H9) indicated that Because of the paucity of field-based palaeontological heritage data on alternative energy or other developments within the broader study region near Luckhoff (cf SAHRIS website), cumulative impacts posed by these developments cannot be realistically assessed. Given the low impact significance assessed for a solar energy development underlain by very similar geology just to the south of the Gariiep River, it is likely that cumulative impacts associated with the Grootpoort Photovoltaic Solar Energy Facility are low.

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 7.1. There have been 14 specific VECs identified with reference to the Solar Project (Table 6.2), which relates to the biophysical and socio-economic environments. Table 7.1 indicates the potential cumulative effects VECs and the rationale for inclusion/exclusion.

Table 7.1: 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. However, the condition of the natural vegetation appears to be moderate.	- Low
Avifauna	Development of multiple solar energy facilities in this region may have cumulative impacts on birds, however limited due to the species which occur in the area.	- Low
Loss or fragmentation of habitats	The developments is not located in an ecological sensitive area.	- Low
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.	- Low
Physical and chemical degradation of the soils by construction vehicles	Should these impacts occur, there may be a cumulative impact on soils in the study area. Soil pollution within and outside the site	- Low

(hydrocarbon spills)	boundary can be prevented through mitigation.	
Disturbance of soils and existing land use (soil compaction)	Should these impacts occur, there may be a cumulative impact on storm water runoff in the study area. However, the effect of compaction mitigation will be localised within the area and will only have an effect during the construction and operational years.	- Low
Impacts of the geology on the proposed development	Issues that may be of concern are the collapsing properties of the surface sands and hard rock excavation. However, the former issue can be designed for, and the latter issue can be addressed by proper documentation prior to construction.	N/A
Hydrology	It was concluded that erosion may occur for certain rainfall intensities and that minimal silting is expected. Therefore, the cumulative effects with regards to soil erosion is considered to be of low significance.	- Low
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 activities and people using the existing gravel roads 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 activities in the area	- Negligible

	and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage. However, no local roads will be used.	
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 & Palaeontological resources	Due to its low significance, the potential for cumulative impact is also considered to be minimal.	- Negligible
Operational Phase		
Soil erosion	Should these impacts occur, there will be a cumulative impact on the water resources in the study area in terms of pollution.	- Medium
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. However, disturbed areas can be rehabilitated.	- 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 and agricultural	- Low

	infrastructure.	
Consumption of water	An additional demand on water sources could result in a significant cumulative impact with regards to the availability of water.	- Medium
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 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 activities and people using the existing gravel roads Grootpoort PV 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:
 - Generation of waste (- Medium)
 - Temporary employment (+ Medium)
 - Impact of construction workers on local communities & influx of job seekers (- Medium)

- Cumulative effects during the operational phase:
 - Soil erosion (- Medium)
 - 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;

(r) 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 the construction phase.
 - Loss or fragmentation of indigenous natural fauna and flora (- Low)
 - Loss or fragmentation of habitats (- Low)
 - Generation of waste (- Low)
 - Impacts on heritage objects (- Low)
 - Temporary employment opportunities (+ Medium)
 - Visual intrusion (- Low)
 - Impact of construction workers on local communities (- Medium for specific individuals who may be affected by STDs etc.)

- Impacts during the operational phase, which include:

- Soil erosion (- Low)
 - Increase in storm water runoff (- Low)
 - Increase in consumption of water (- Medium)
 - Visual intrusion (- Low)
 - Leakage of hazardous materials (- Low)
 - Permanent employment opportunities (+ Medium)
 - Generation of additional electricity (+ Medium)
 - The establishment of a community trust (+ Medium)
- During the decommissioning phase -
 - Generation of waste (- Low)
 - Loss of employment (- Low)

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 Grootpoort Solar Power Plant and associated infrastructure, Registration Division Fauresmith, Free State 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 EMP should not be neglected and a copy of the EMP should be made available onsite at all times.

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

Marelie Griesel

Environamics - Environmental Consultants

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