ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT REPORT

PROPOSED BOSJESMANSBERG PV CENTER SOLAR ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE
DEA Ref. No: 14/12/16/3/3/2/579

DRAFT FOR PUBLIC REVIEW
19 February 2014 - 20 March 2014

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PROJECT DETAILS

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Title	:	Environmental Impact Assessment Process Draft Environmental Impact Assessment Report: Proposed Bosjesmansberg PV Center Solar Energy Facility
Authors	:	Savannah Environmental (Pty) Ltd Steven Ingle Karen Jodas
Client	:	Networx Renewables (Pty) Ltd
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PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Networx Renewables (Pty) Ltd an Independent Power Producer (IPP), is proposing the establishment of a commercial solar electricity generating facility and associated infrastructure on portion 1 of the farm Bosjesmansberg 67 located approximately 16 km east of Copperton in the Siyathemba Local Municipality under the jurisdiction of the Pixley ka Seme District Municipality, Northern Cape Province. The proposed facility will be known as the **Bosjesmansberg PV Center Solar Energy Facility** and is one of four 75MW solar PV projects proposed to be developed by Networx on Portion 1 of the Farm Bosjesmansberg 67.

Networx Renewables (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) for the proposed facility. The EIA process is being undertaken in accordance with the requirements of the EIA Regulations of June 2010 (of GNR543) promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The Draft EIA Report consists of nine chapters:

» Chapter 1 provides background and an introduction to the proposed project(s) and the environmental impact assessment.
» Chapter 2 describes the proposed project and explains the overall project requirements from a technical perspective.
» Chapter 3 explains the regulatory and legal context for electricity generation projects and the EIA process.
» Chapter 4 explains the approach to undertaking the EIA phase.
» Chapter 5 describes the existing biophysical and socio-economic environment.
» Chapter 6 describes the assessment of environmental impacts associated with the proposed solar energy facility.
» Chapter 7 describes the assessment of cumulative environmental impacts associated with the proposed solar energy facility.
» Chapter 8 presents the conclusions of the impact assessment for PV Center as well as an impact statement.
» Chapter 9 contains a list of references for the EIA report and specialist reports.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for

potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders are invited to comment on the draft EIA Report which has been made available for public review and comment at the following locations from **19 February 2014 - 20 March 2014.**

- Siyathemba Municipal Library
- IetzNietz Lodge (Alkantpan)
- www.SavannahSA.com

Please submit your comments to
Gabriele Wood of Savannah Environmental (Pty) Ltd PO Box 148, Sunninghill,2157, Gauteng Tel: 011 656 3237 Fax: 086 684 0547 E-mail: gabriele@savannahsa.com
The due date for comments on the Draft EIA Report is **20 March 2014**

Comments can be made as written submission via fax, post, or e-mail.

EXECUTIVE SUMMARY

Networx is proposing to establish four 75MW commercial photovoltaic solar energy facilities on Portion 1 of the Farm Bosjesmansberg 67 near Copperton. The assessment of impacts of one of the proposed 75MW projects, known as the Bosjesmansberg PV Center Solar Energy Facility, is the subject of this EIA Report. PV Center is located within the Siyathemba Local Municipality in the Northern Cape Province. The purpose of PV Center is to add new capacity for generation of power from renewable energy to the national electricity supply.

PV Center will occupy approximately 220ha of the defined 338ha site initially identified within the northern section of the greater farm portion which is 5 350 ha in extent. The site of PV Center occupies approximately 6.3% of the total site, while the proposed facility footprint will occupy only areas of low environmental sensitivity identified within the project site.

The infrastructure associated with the project includes:

» Arrays of PV panels and respective inverter stations
» Appropriate mounting structures
» Cabling between the project components, to be lain underground where practical
» An on-site substation including a building for control and storage
» An overhead power line to facilitate the connection between the on-site substation and the Eskom grid via a loop in/loop out configuration to the Cuprum-Burchell 132kV power line which traverses the greater farm portion
» Permanent laydown areas
» Laydown areas for the construction phase
» Internal access roads
» Fencing.

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws associated with the proposed site identified for the development of PV Center. Potential environmental impacts and some areas of high sensitivity were however identified. In summary, the most significant environmental impacts associated with PV Center, as identified through the EIA, include:

» Impacts on ecology and listed floral species.
» Impacts on avifauna.
» Impacts on the local soils, land capability and agricultural potential of the site.
» Visual impacts mainly due to the solar panels and partly due to other associated infrastructure (power line, access road etc.).
» Heritage impacts.
» Social and economic impacts.
» Cumulative impacts.

From the conclusions of the detailed EIA studies undertaken, sensitive areas within the development footprint area were identified and

flagged for consideration and avoidance by the facility layout. The most significant environmental impacts identified and assessed to be associated with the proposed PV Center project include:

» Impacts on listed floral species which occur in isolated areas within the site boundaries
» Impacts on Stone Age archaeological material of low significance and widespread throughout the farm.

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the PV Center project and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the identified impacts can be mitigated to an acceptable level.

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DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

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

Drainage line: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may or may not be present.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

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

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Water course: as per the National Water Act means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CO_2	Carbon dioxide
DEA	National Department of Environmental Affairs
DEADP	Department of Environment Affairs and Development Planning
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GHG	Green House Gases
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
MAR	Mean Annual Rainfall
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NGOs	Non-Governmental Organisations
NWA	National Water Act (Act No. 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

INTRODUCTION CHAPTER 1

1.1. Project Background

Networx Renewables (Pty) Ltd (hereafter referred to as Networx) an Independent Power Producer (IPP), is proposing the establishment of a commercial solar electricity generating facility and associated infrastructure on portion 1 of the farm Bosjesmansberg 67 located approximately 16 km east of Copperton in the Siyathemba Local Municipality under the jurisdiction of the Pixley ka Seme District Municipality, Northern Cape Province. The proposed facility will be known as the **Bosjesmansberg PV Center Solar Energy Facility** (henceforth referred to as PV Center) and is one of four 75MW solar PV projects proposed to be developed by Networx on Portion 1 of the Farm Bosjesmansberg 67.

Networx has appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) process for the proposed PV Center facility. The EIA process is being undertaken in accordance with the requirements of the DEA (based on acceptance of Scoping) and the EIA Regulations of June 2010 (GNR543) promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The proposed project will make use of photovoltaic (PV) technology and will have a generating capacity of up to 75MW. PV Center will comprise of the following typical infrastructure which is included in the scope of this EIA:

» Arrays of PV panels and respective inverter stations
» Appropriate mounting structures
» Cabling between the project components, to be lain underground where practical
» An on-site substation including a building for control and storage
» An overhead power line to facilitate the connection between the on-site substation and the Eskom grid via a loop in/loop out configuration to the Cuprum-Burchell 132kV power line which traverses the greater farm portion.
» Permanent laydown areas
» Laydown areas for the construction phase
» Internal access roads
» Fencing.

The construction of alternative overhead distribution power lines to connect the facility to the Eskom grid is also being assessed as part of the larger project,

since current grid connectivity conditions for PV Center may change in future (i.e. if the capacity on the Cuprum-Burchell 132kV power line is taken up prior to this project being developed). Two alternative power lines for evacuation of power generated by the PV Center project, both of which are up to 20km include:

- » the construction of a new power line from the on-site substation to the existing Cuprum Substation or;
- » the construction of a new power line from the on-site substation to the existing Kronos Substation via an alignment adjacent to the R357 or alternatively, via a southerly alignment.

The above-mentioned proposed power lines to the Cuprum and Kronos Substations are being **assessed under a separate Basic Assessment process** and are not further discussed or evaluated in this EIA Report. A full impact assessment and public participation process will be conducted for the power lines as part of the separate Basic Assessment process. Reference to these power lines is provided in the interest of fully describing all infrastructure associated with the project.

As indicated above, PV Center is one of four commercial photovoltaic (PV) facilities proposed to be situated over different areas of Portion 1 of the farm Bosjesmansberg 67. Each of the 75MW projects are proposed to have stand-alone infrastructure, as each will be bid to the DoE under the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme and developed separately (likely by separate project companies).

While the focus of this EIA Report will be on the evaluation and assessment of impacts associated with PV Center, the other three 75MW projects proposed to be established on the farm will be described or assessed in the relevant sections in the interest of holistically describing the full extent of the project and potential impacts (including cumulative impacts) over the greater farm portion. The DEA reference numbers for each PV facility application for which separate EIA Reports have been compiled are as follows:

- » Proposed Bosjesmansberg Center PV Plant (focus of this EIAR) – DEA Reference No 14/12/16/3/3/2/579
- » Proposed Bosjesmansberg East PV Plant – DEA Reference No 14/12/16/3/3/2/579/1
- » Proposed Bosjesmansberg West PV Plant – DEA Reference No 14/12/16/3/3/2/579/2
- » Proposed Bosjesmansberg South PV Plant – DEA Reference No 14/12/16/3/3/2/579/3

In addition, the larger project also includes two alternative power line connection options for which separate Basic Assessment reports are being compiled. The full

extent of the larger project therefore includes 4 separate 75MW PV facilities with all associated infrastructure for each, and 2 separate and independent 132kV power line connections connecting each of the four 75MW PV projects to the Eskom grid.

1.2. Structure of this EIR

The nature and extent of PV Center, as well as the potential environmental impacts associated with the construction, operation and decommissioning associated with the proposed project is explored in more detail in this EIAR. This EIAR is split into the following chapters:

» Chapter 1 provides background and an introduction to the proposed project(s) and the environmental impact assessment.
» Chapter 2 describes the proposed project and explains the overall project requirements from a technical perspective.
» Chapter 3 explains the regulatory and legal context for electricity generation projects and the EIA process.
» Chapter 4 explains the approach to undertaking the EIA phase.
» Chapter 5 describes the existing biophysical and socio-economic environment.
» Chapter 6 describes the assessment of environmental impacts associated with the proposed solar energy facility.
» Chapter 7 describes the assessment of cumulative environmental impacts associated with the proposed solar energy facility.
» Chapter 8 presents the conclusions of the impact assessment for PV Center as well as an impact statement.
» Chapter 9 contains a list of references for the EIA report and specialist reports.

1.3. Overview of the Proposed Development

The proposed PV Center project falls within the Siyathemba Local Municipality which falls under the jurisdiction of the Pixley Ka Seme District Municipality of the Northern Cape Province. The project development site is located in the sparsely populated, arid Karoo region, approximately 16 km east of the small former mining town of Copperton on a 338ha area of Portion 1 of the farm Bosjesmansberg 67, which encompasses a total area of 5 350ha in extent (i.e. the project development area is approximately 4.1% of the total extent of the total farm portion). The PV facility footprint will be approximately 220ha in extent. The location of the larger farm portion and the 75MW project development area is shown in **Figure 1.1**.

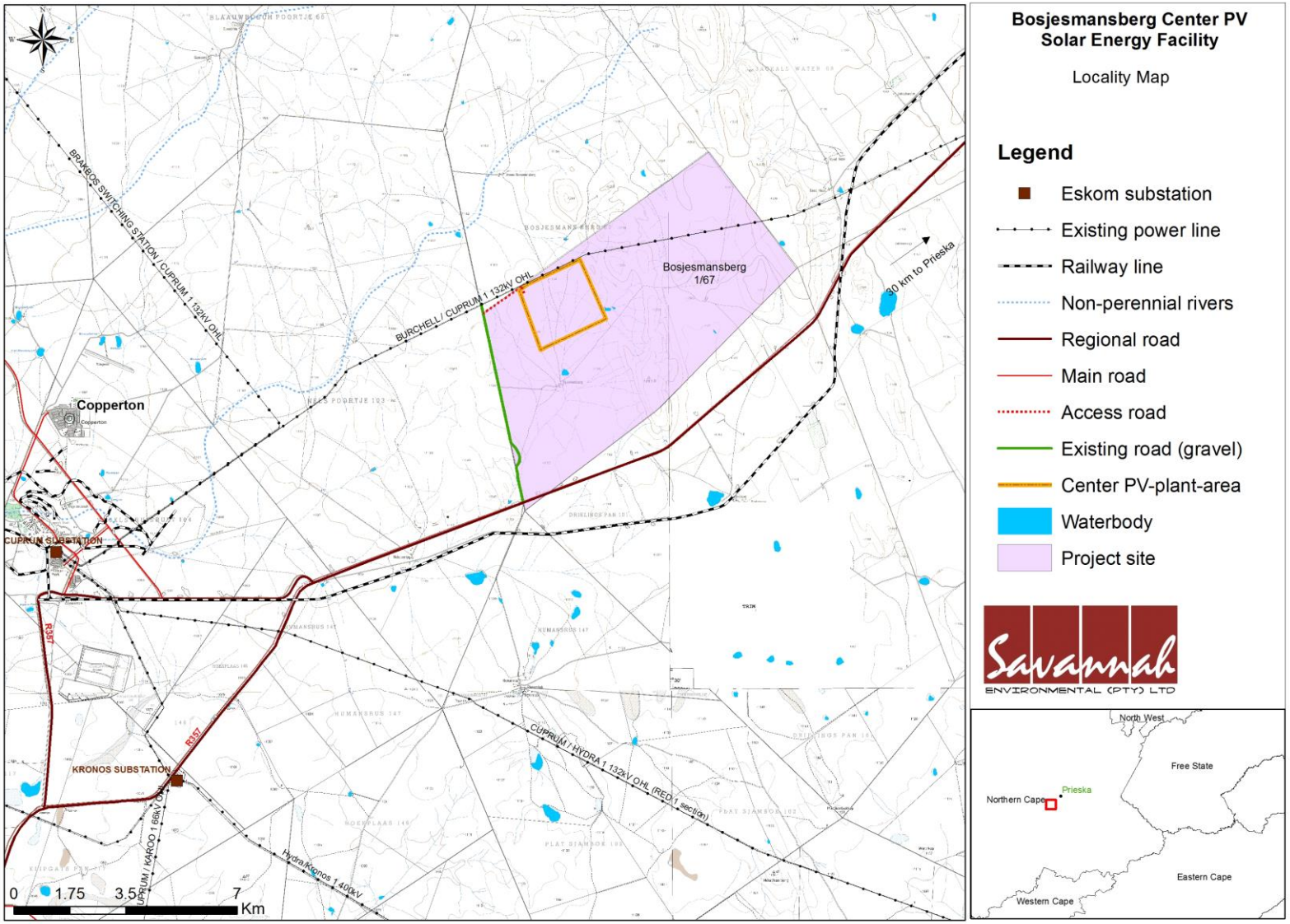

Figure 1.1: Locality map illustrating the location of the proposed Bosjesmansberg PV Center Solar Energy Facility within the boundaries of Portion 1 of the Farm Bosjesmansberg 67, near Copperton, Northern Cape Province

The scope of the EIA will apply to the development footprint and associated infrastructure for PV Center. The proposed 75MW facility will accommodate several arrays of photovoltaic (PV) panels and associated infrastructure and this infrastructure, as well as internal access roads, substations, offices, etc. will be described.

1.4. Conclusions from the Scoping Phase

The scoping phase considered the entire extent of Portion 1 of the Farm Bosjesmansberg 67. The purpose of the scoping was to conduct a land capability evaluation of the entire form portion in order to determine feasible sites for the development of the 75 MW facility/ies as no contiguous low-sensitive sites where a contiguous development could be constructed were identified.

Specialist input: Several desktop specialist studies were undertaken for the purposes of identifying potential impacts and potential fatal flaws relating to the larger 300MW project (i.e. the 4 x 75MW projects). The sensitivities and impacts identified as potentially resulting from the project broadly included social, agricultural, ecological, avifaunal, heritage and visual impacts. In response to the land capability assessment conducted at Scoping, four separate areas were identified to carry into the EIA phase for assessment as individual 75MW projects, which would result in the least impact.

Public participation: During the public participation process conducted during Scoping, the proposed project was generally well received by the recipient community, interested and affected parties as well as stakeholders. No significant concerns or objections to the proposed 300MW facility development were noted, nor was any concern raised with respect to the individual 75MW PV projects. Comments that were raised by Interested and Affected Parties (note that these were applicable to the entire 300MW project) are summarised as follows and were accordingly captured in the Comments and Responses Report:

- Building line restrictions and requirements for upgrade of gravel roads (Department of Roads and Public Works)
- Impact on avifauna from new power lines (Pixely Ka Seme District Municipality)
- Impact on protected tree species (Department of Agriculture, Forestry and Fisheries)
- Potential impact on the Square Kilometre Array (SKA, South Africa)
- Use of local contractors (LED Manager)
- Impact of dust during construction (adjacent landowner)
- Insufficient accommodation in the area (adjacent landowner)
- Sourcing of water for construction purposes (adjacent landowner)

Interpretation of scoping results: No environmental or social fatal flaws were identified to be associated with the broader site during the Scoping phase of the EIA process and the Final Scoping Report was accepted by DEA in February 2014.

The results of the Scoping phase and environmental sensitivity map were interpreted by the developer and a draft layout plan (primarily taking into account ecological and archaeological considerations) was prepared for assessment during the EIA phase. This layout plan has subsequently been further refined during the EIA phase to consider the findings of EIA Phase specialist studies, particularly in response to the ecological and heritage sensitivities identified on the site.

1.5. Requirement for an Environmental Impact Assessment Process

The proposed solar energy facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project and contains the requirements of the DEA.

EIA Regulations overview: NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24 (1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and considered to be a national priority in terms of the Energy Response Plan and Strategic Infrastructure Plan, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environmental and Nature Conservation (DENC) will act as a commenting authority for the application.

Compliance with the requirements of the EIA Regulations ensures that decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. An application for authorisation has been accepted by DEA for the proposed project under application reference number **14/12/16/3/3/2/579**.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the developer with the opportunity of being fore-warned of

potential environmental issues. Subsequently it may assist with the resolution of issues reported on in the Scoping and EIA Phases as well as promoting dialogue with interested and affected parties (I&APs) and stakeholders. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations R543, an EIA is required to be undertaken for this proposed project as the proposed project includes the following "listed activities" applicable to each of the four phases, in terms of GN R544, R545 and R546 (GG No 33306 of 18 June 2010 as amended).

Listed activities: As stated previously, separate applications for environmental authorisation for each of the 75MW projects proposed to be developed on the broader farm have been accepted by DEA under individual application reference numbers. Each 75MW project will require authorisation for activities applicable to that specific facility.

The list of listed activities requiring Environmental Authorisation for PV Center has been revised during the EIA Phase due to a clearer understanding of the project scope, its potential impacts and refinement of the layout plan in the EIA Phase. This is made possible through the availability of detailed designs provided by the applicant in response to the identified environmental sensitivities.

A summarised description of each of the listed activities is provided in Table 1 below. A full description of the impacts associated with the listed activities is provided in the impact assessment chapter (Chapter 6 and 7). The Conclusions chapter (Chapter 8) provides a concluding statement for each of the listed activities applied for and concludes whether the listed activity should be authorized, based on the outcome of the evaluation, impact assessment and relationship of the project footprint to the environment.

Listed Activities applicable to the proposed Bosjesmansberg PV Center Solar Energy Facility Relevant Notice	**Activity No.**	**Description of Listed Activity**	**Relevant Component(s) of Facility and Applicability of proposed project to listed activity**
GN544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts	An on-site substation of 132kV will be constructed on the site in order to aid in the export of the generated capacity.

GN 544, 18 June 2010	11	The construction of: (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The south-eastern extent of the facility will be located within 32m from an ephemeral, non-perennial drainage line which traverses the PV Center site
GN544, 18 June 2010	18	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 or more than 5 cubic metres from (i). a water course	The infilling or depositing of material from a watercourse could occur during the construction phase for the facility and associated infrastructure.
GN 544, 18 June 2010	22	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres	Internal access roads adjacent to the on-site substation accessing the PV arrays will required to be constructed.
GN545, 18 June 2010	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.	The facility will have a generating capacity of 75MW
GN545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;	The site represents 388ha of agricultural land of which approximately 220ha will be transformed from agricultural land use to an industrial land use for a minimum of 20 but up to 50 years.

GN546, 18 June 2010	14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) In Northern Cape: i. All areas outside urban areas	The clearance of approximately 220ha of vegetation could be required to be undertaken exclusively within the calcrete plains of low ecological sensitivity, but where 75% of this habitat constitutes indigenous vegetation.

1.6. Objectives of the EIA Process

The Scoping Phase for the proposed PV project was completed in December 2013 and the Plan of Study for EIA was approved in February 2014. The scoping phase served to identify potential impacts associated with the proposed project and to define the extent of studies required within the EIA Phase. The Scoping Phase included input from the project proponent, specialists with experience in the study area and in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

This EIA Phase (i.e. the current phase) and EIA report addresses identified environmental impacts (direct, indirect, and cumulative as well as positive and negative) associated with the different project development phases (i.e. design, construction, operation, and decommissioning). The EIA Phase also recommends appropriate mitigation measures for potentially significant environmental impacts. The release of a draft EIA Report provides stakeholders with an opportunity to verify that issues they have raised through the EIA Process have been captured and adequately considered. The final EIA Report incorporates all issues and responses raised during the public review phase prior to submission to DEA. The EIA phase was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of NEMA.

1.7. Details of the Environmental Assessment Practitioner and Specialist Team

Savannah Environmental was appointed by Networx as the independent EAP to undertake the EIA process for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants are subsidiaries of or are affiliated to Networx. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The EAPs from Savannah Environmental who are responsible for this project are:

» Steven Ingle - Steven Ingle, the principal author of this report is a senior environmental consultant with over 7 years of experience in the environmental field and holds a degree in Environmental Management. His competencies lie in environmental impact assessments for large scale infrastructure, property and mining projects, environmental due diligence and risk assessment, environmental compliance monitoring, waste management licensing and strategic environmental assessment.
» Sheila Muniongo - holds a Bachelor degree with Honours in Environmental Management and has three years experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects. She is currently involved in several EIAs for renewable energy project EIAs across the country.
» Karen Jodas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 16 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country and the EAP on this project.
» Gabriele Wood - the public participation consultant for this project, hold an Honours Bachelor degree in Anthropology and has 5 years' experience in Public Participation and Social consultancy including professional execution of public participation consulting for a variety of projects as well as managing and coordinating public participation processes for Environmental Impact Assessments (EIA).

Savannah Environmental has developed a detailed understanding of impacts associated with the construction and operation of renewable energy facilities through their involvement in numerous EIA processes for these projects. In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed specialist consultants as required.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, the following specialist sub-consultants were consulted to conduct specialist impact assessments:

» Ecology – Simon Todd
» Geology, soils, and erosion and agricultural potential – Johann Lanz
» Heritage resources – Heritage Contracts and Archaeological Consulting CC (HCAC)
» Avifauna – Dr Doug M. Harebottle
» Visual – MetroGIS (Pty) Ltd
» Social – Tony Barbour

Curricula vitae for the Savannah Environmental project team and its specialist sub-consultants are included in Appendix A.

DESCRIPTION OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the proposed Bosjesmansberg PV Center Solar Energy Facility and provides details regarding the rationale and purpose of the project, details regarding the site selection process and methodology for designing the facility in response to the identified sensitivities.

This chapter also addresses the project scope which includes the planning and design, construction, operation and decommissioning phases. PV Center will be a stand-alone project in line with the DoE requirements under the REIPPP Programme. This chapter also explores the "Do-Nothing" alternative - that is, the alternative of not establishing the proposed PV Center project on Portion 1 of the Farm Bosjesmansberg 67.

2.1. Need and justification for the Proposed Project

2.1.1 Strategic Infrastructure Projects under the National Infrastructure Plan

According to South African Government Online[1] the South African Government adopted a National Infrastructure Plan (NRP) in 2012 that intends to transform South Africa's economic landscape while simultaneously creating significant numbers of new jobs and to strengthen the delivery of basic services. Under the NRP, Government will, over the three years from 2013/14, invest R827 billion in the building of new and the upgrading of existing infrastructure. In order to address these challenges and goals, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC) and under their guidance developed 18 Strategic Integrated Projects (SIPs), three of which are energy-related SIPs and include:

» SIP 8: Green energy in support of South African economy - Support sustainable green energy initiatives on a National scale through a diverse range of clean energy options envisaged in the IRP.
» SIP 9: Electricity Generation to support socio-economic development: Accelerate construction of new electricity capacity in accordance with the IRP to meet the need of the economy and address historical imbalance.
» SIP 10: Electricity transmission and distribution for all - Expansion of the transmission and distribution network for all and support economic development.

[1] http://www.gov.za/issues/national-infrastructure-plan /index.html#energy

In fulfilment of SIP 8 (green energy) and to meet the targets set in the Integrated Resource Plan (IRP 2010), the Department of Energy has introduced the REIPPP Programme, which is now in its fourth year. The proposed Bosjesmansberg PV Center Solar Energy Project will contribute towards SIP 8 and SIP 9 due to the addition of clean energy to the grid (increasingly significant if all four PV projects are developed over Portion 1 of the Farm Bosjesmansberg 67) and the project/s will create significant socio-economic benefits at a local, regional and national scale. The associated power line infrastructure will see the transmission of energy into the national grid and thus contribute towards SIP 10.

2.1.2 Rationale for the proposed project

The purpose of the proposed PV Center development is to supply renewable energy to the national grid (which is short of generation capacity to meet current and expected demand) and to aid in achieving the goal of a 30% share of all new power generation being derived from Independent Power Producers (IPPs), as targeted by the Department of Energy (DoE).

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of non-renewable resources. In order to meet the long-term goal of a sustainable renewable energy industry, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new build power generation being derived from renewable energy forms by 2030. This is, however, dependent on the assumed learning rates and associated cost reductions for renewable options.

PV Center and the infrastructure associated with the facility is proposed to be developed as a stand-alone commercial solar energy facility. The power generated from the project will be sold to Eskom to feed into the national electricity grid. Networx (or any subsequent project developer) will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA) for each 75MW facility, as well as sign a power purchase agreement (PPA) with Eskom (typically for a period of 20 years) in order to build and operate each facility. As part of the agreement, the IPP will be remunerated per kWh by Eskom who will be financially backed by Government. Depending on the economic conditions following the lapse of this period, each solar energy facility can either be decommissioned, or the power purchase agreement may be renegotiated and extended for a further period.

It is considered viable that long-term benefits for the community and/or society in general can be realised should the four 75MW projects prove to be acceptable from a technical and environmental perspective. The projects have the potential to contribute to the national electricity supply and to increase the security of supply to consumers as well as supporting South Africa's commitment to reducing greenhouse gas emissions. Over 90% of South Africa's electricity generation is currently coal-based, resulting in annual per capita carbon emissions of approximately 8.9 tons per person, according to 2008 World Bank estimates. According to the Carbon Dioxide Information Analysis Centre, South Africa is the 13th largest carbon dioxide emitting country, based on 2008 fossil-fuel CO_2 emissions. The nation is also the largest emitting country on the continent of Africa, pinpointing the importance of introducing greener solutions to the energy mix. Furthermore, it may provide both economic stimulus to the local economy through the construction process and long term employment (i.e. management and maintenance) during the operation phase of each project.

2.1.3 Selection of the proposed project site

Due to the nature of the development (i.e. PV solar energy facilities), the location of the facilities are largely dependent on technical and environmental factors such as solar irradiation (i.e. the fuel source), climatic conditions, topography of the site, and access to the grid. Studies of solar irradiation worldwide indicate that the Northern Cape shows great potential for the generation of solar power. The proposed project is located in an area of high irradiation generating up to 2240 kWh/m² annually, as shown in Figure 2.1 below.

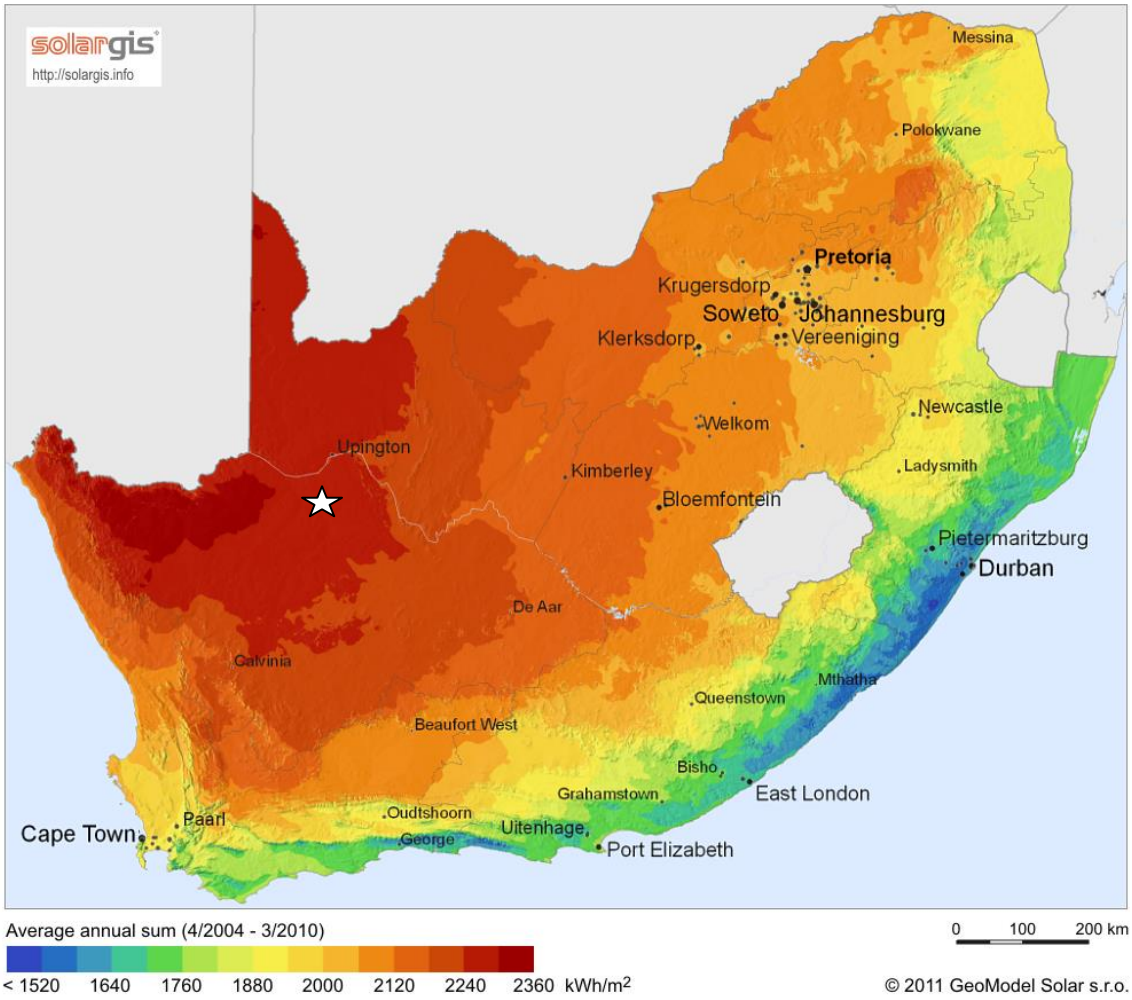

Figure 2.1 Solar irradiation map for South Africa (Source: GeoModel Solar, 2011). The study area is indicated by the white star.

Receptiveness of the site to PV Development: The Copperton area presents optimal conditions for the siting of solar energy facilities due to high irradiation values and optimised grid connection opportunities. Portion 1 of the Farm Bosjesmansberg 67 where PV Center is proposed to be located is considered suitable and favourable from a technical perspective due to the following site characteristics:

» **Climatic conditions:** Climatic conditions determine the economic viability of a solar energy facility as it is directly dependent on the annual direct solar irradiation values for a particular area. The Northern Cape receives the highest average daily direct normal and global horizontal irradiation in South Africa which indicates that the regional location of the project is appropriate to a solar energy facility. Factors contributing to the location of the project include the relatively high number of daylight hours and the low number of rainy days experienced in this region. A Global Horizontal

Radiation (GHI)2 of ~2240 kWh/m²/year is relevant for the area in which the site is located.

» **Topographic conditions:** The site conditions are optimum for a development of this nature, with the majority of the site being characterised by flat terrain apart from a rocky ridge bisecting the greater farm portion. The slope and aspect of the PV Center site is predominantly flat. A level surface area (i.e. a gradient of 3% or less) is preferred for the installation of PV panels. The project area is of a suitable gradient for a PV project.

» **Extent of the site:** Significant land area is required for the proposed development (approximately 2.5ha per MW). Space is a constraining factor for a large-scale PV solar facility installation. Considering that 220ha of land is required for the project (or 4.1% of the 5 354ha farm), there is sufficient space for the development of this project (as well as the other three PV projects proposed to occur on the farm). The proposed delineated 338ha project site is larger than required and approximately 220ha would need to be developed in order to achieve the desired output (75MW). The PV Center project site is significantly larger than the area required for development which would allow for the avoidance of any identified environmental or technical constraints.

» **Site availability and access:** The land is available for lease by the developer. The proposed development site is adjacent to the R357 road. Access to the site is facilitated via the R357 with available access points on the western boundary of the site. Existing internal roads on the larger farm portion provide access to the proposed 75MW PV project.

» **Grid connection:** The Cuprum-Burchell 132kV power line traverses the greater farm portion, and would allow for a direct connection to the grid via a loop in – loop out configuration. This would only require a short length of line to be constructed. In addition, a further two connection options are available at both the Kronos Substation and Cuprum Substation, which are situated approximately 20km south-west and 20km to the west respectively. Both of these substations are considered to be relatively close to the greater farm portion and allow for relatively short power line lengths. This is a unique situation for a project to have a number of grid connection options, maintaining the viability of the authorised project even if other projects are constructed and connected ahead of the PV Center project. .

Exploration phase: It was on the basis of South Africa's strategic imperatives, the optimised irradiation of the region and grid connectivity conditions that Networx approached the landowner of the proposed site and presented a business case for the development of a renewable energy facility on the farm. The

[2] GHI is the total amount of shortwave radiation received from above by a surface horizontal to the ground. This value is of particular interest to photovoltaic installations and includes both Direct Normal Irradiance (DNI) and Diffuse Horizontal Irradiance (DIF).

landowner holds title to approximately 11 000ha of land outside Copperton where sheep and cattle farming is practised. During negotiations between these parties, Eskom was approached to determine whether capacity in the grid was available. It subsequently became apparent based on the extent of the site and feedback from Eskom that a project of up to 300MW could potentially be developed. Due to the 75MW capacity limit imposed by the Department of Energy's (DoE) Renewable Energy Programme, it was subsequently decided, after DEA approval of the Scoping Report, that the total 300MW would be split into 75MW areas in order to be bid to the DoE as 4 stand-alone 75MW facilities.

2.1.4 Process for identification of the project site within the greater farm portion

The Scoping process served to determine any areas of high environmental sensitivity and limit the extent of the greater farm portion available for proposed PV development. This was done as a land capability assessment in order to evaluate and mitigate the impact on soil, land, air and water resources. Failure to manage land in accordance with its capability risks degradation of resources both on-site and off-site, leading to a decline in natural ecosystem values, agricultural productivity and infrastructure functionality. The outcome of the land capability assessment allowed the developer to test the merits of the site and discard other areas of the site which were under consideration due to environmental constraints (this included identification of suitable areas for all 4 solar facilities, i.e. PV Center, PV East, PV West and PV South).

It was therefore decided against aggregating the full 300MW development (combination of the four 75MW projects proposed within the greater farm portion) into a single contiguous area as there is not a contiguous low sensitivity area on the larger farm portion which is large enough to accommodate the four individual 75MW PV projects.

Alternative sites within the property farm boundary were excluded based on the identified environmental constraints. The location of PV Center therefore aims to avoid these identified sensitivities and the area available for the layout of the infrastructure is constrained on this basis.

The boundaries of PV Center were therefore not defined by any physical or farm boundary, but were delineated based on:

a) Preliminary developable areas identified during the Scoping phase by the environmental team. A land capability assessment as part of the Scoping process resulted in the selection of a site of suitable size which could accommodate the PV Center development.
b) Following presentation of the PV Center site to the developer based on criteria determined at Scoping, technical requirements in terms of

optimising the position of the PV array as well as the associated infrastructure within the boundaries of the project site were evaluated by the developer; and

c) Determining the requirements of the landowner based on any identified constraints from a farming or land use perspective.

No feasible alternative locations within the broader site for any of the four 75MW PV areas were therefore identified for investigation and are not considered as site alternatives to each other.

The greater farm portion is traversed in an east-west direction by the Burchell-Cuprum No.1 132kV power line. This power line is situated parallel to the northern boundary of the PV Center site. Direct access to the power line via a loop in – loop out configuration is required. The larger farm portion is situated adjacent to the R357 and access to the site is via an existing access road which runs parallel to the western boundary of the larger farm portion, which in turn provides access to the north-western section of the farm. Optimal access and grid connectivity conditions therefore were important in the selection of the project site.

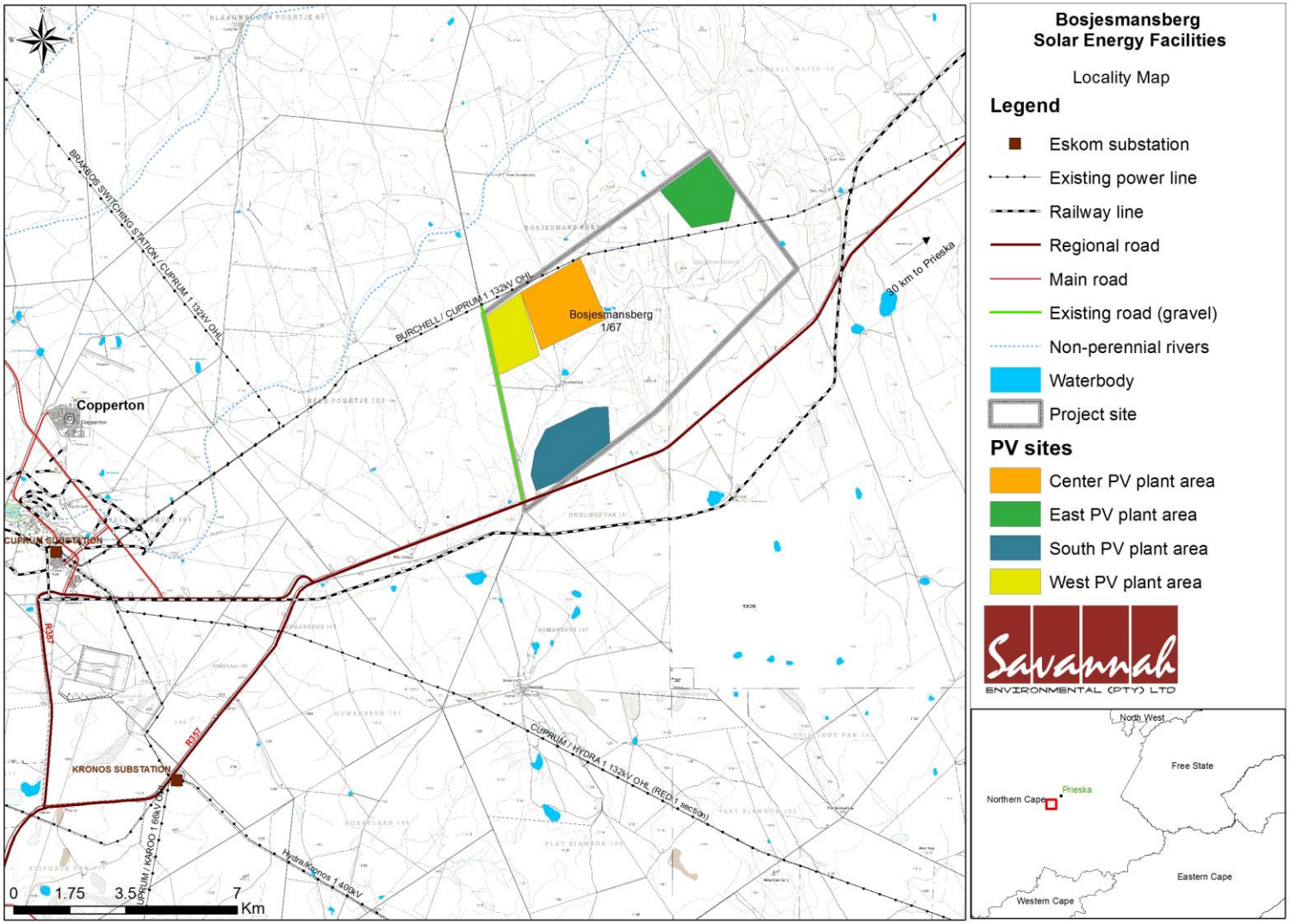

Figure 2.2: Map indicating the four 75MW project areas identified at the Scoping phase for PV Center, PV East, PV West and PV South following the results of the land capability assessment

2.2. Project Description

2.2.1 Optimising the proposed PV facility within the site boundary and the consideration of alternative layouts

A combined area of approximately 220ha is required for the development of the PV module arrays and associated infrastructure. PV Center is proposed to be located within an area of 388ha in extent and is situated in the central and northern section of the greater farm portion (refer to Figure 2.3).

Following the identification of the project site for PV Center during the Scoping Phase and based on the land capability of the greater farm portion, the process of designing the layout for PV Center within the boundaries of the PV Center project site was initiated by the developer. This process was highly dependent on the site sensitivities determined during the EIA phase through specialist involvement and field surveys. The site sensitivities identified within the PV Center site, to which the layout plan has responded, include the following:

» A pan of high ecological and high heritage sensitivity;
» Drainage lines and washes of high sensitivity;
» Grasslands of moderate sensitivity; and
» A Stone Age site important from an archaeological perspective.

A layout of the proposed PV site and associated infrastructure (such as on-site substation, power line, access roads, and laydown areas) considered within this EIA Report has been generated by the developer. All sensitive features identified through the field surveys have now been avoided in terms of the layout plan to avoid or mitigate direct impacts as far as possible (refer to Figure 2.3).

Based on the above, the layout of the proposed PV Center 75MW facility occupies the full extent of areas of low ecological and heritage sensitivity. The layout plan provided by the developer (Figure 2.3) is therefore considered to be the most optimal layout from an environmental perspective and the need to present further layout alternatives is constrained on this basis. No feasible layout alternatives are available for assessment. No assessment of layout alternatives is therefore warranted.

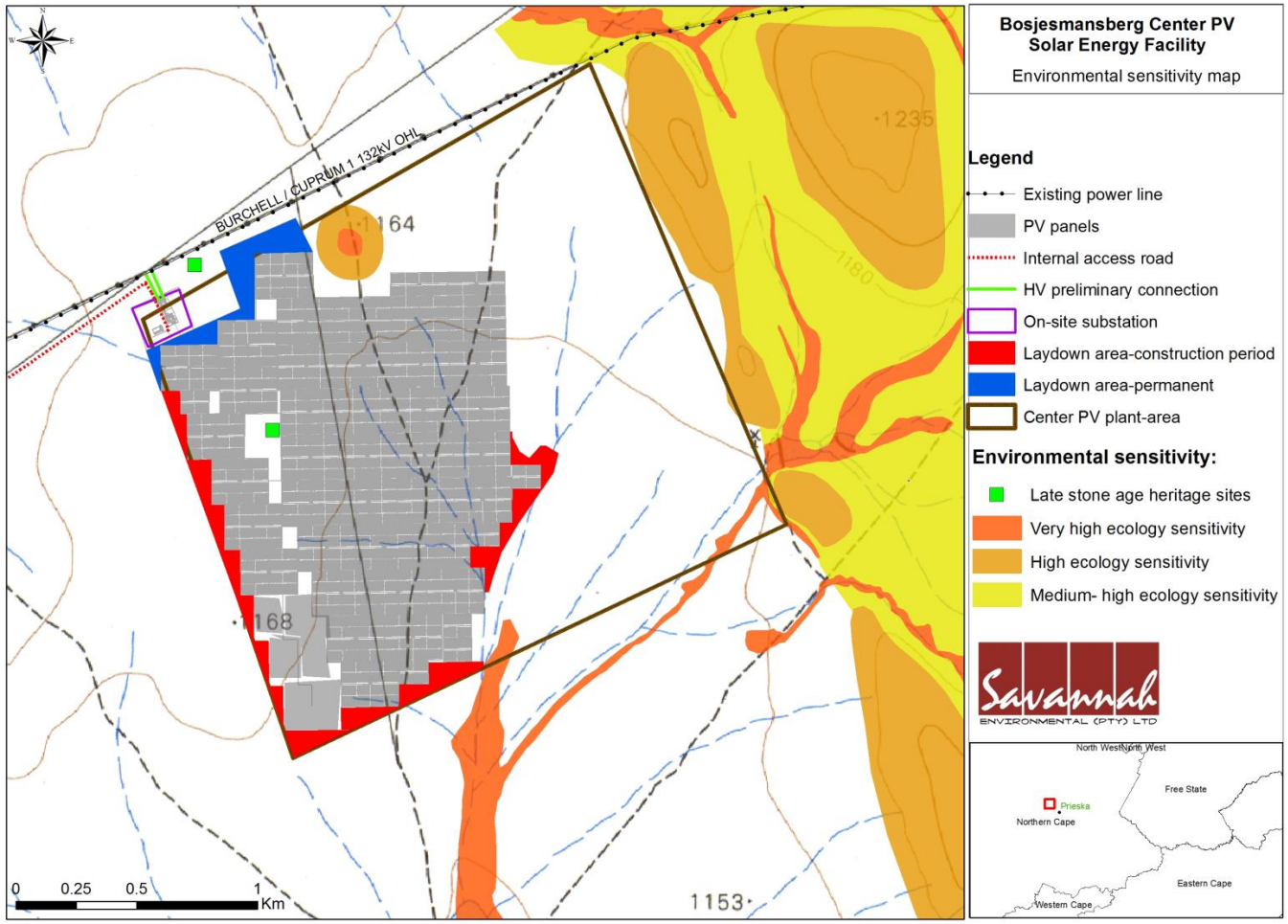

Figure 2.3: Areas of ecological and heritage sensitivity determined through specialist studies used as a basis for the preparation of the layout for the proposed Bosjesmansberg PV Center Solar Energy Facility

2.2.2 Description of the proposed facility and associated infrastructure

PV Center is intended to generate electricity by harnessing solar energy (from the sun) by utilising photovoltaic (PV) technology and has a proposed generating capacity of up to 75MW. The main components of the proposed facility include:

- Arrays of PV panels and respective inverter stations;
- Appropriate mounting structures;
- Cabling between the project components, to be lain underground where practical;
- An on-site substation;
- A building for control and storage;
- An overhead power line to facilitate the connection between the on-site substation and the Eskom grid via a loop in/loop out of the Cuprum-Burchell 132kV power line which traverses the greater farm portion;
- Internal access roads; and
- Fencing.

Table 2.1 below provides relevant technical information for the proposed PV Center project. These are illustrated in Figure 2.4.

Table 2.1: Maximum dimensions[3] or measurements of infrastructure for PV Center

Aspect	Value / description
Number of PV panels required	287 500
Height of PV panels	< 5 m
Area of PV Array	220 ha
Number of inverters required	39
Area occupied by inverter / transformer stations / substations	10 000 m^2
Capacity of on-site substation	33/132kV; 80MVA
Area occupied by both permanent and construction laydown areas	5 ha
Area occupied by buildings	1 200 m^2
Length of internal roads	15 km
Width of internal roads	3.5 m
Proximity to grid connection	150 m
Height of fencing	2 m
Type of fencing	Electrical

[3] Note that these values may be subject to nominal changes depending on the final procurement process (selected manufacturers, panel and inverter models, etc.)

Construction phase water requirements	7200 m^3/ year
Operational phase water requirements	1 350 m^3 / year
Electricity supply during construction	Landowner connection to be provided
Potable water supply during construction	Boreholes on site, municipality or other service provider
Construction works water supply	Boreholes on site, municipality or other service provider
Sanitation	Potable chemical toilets
Waste removal	Waste Management Contractor

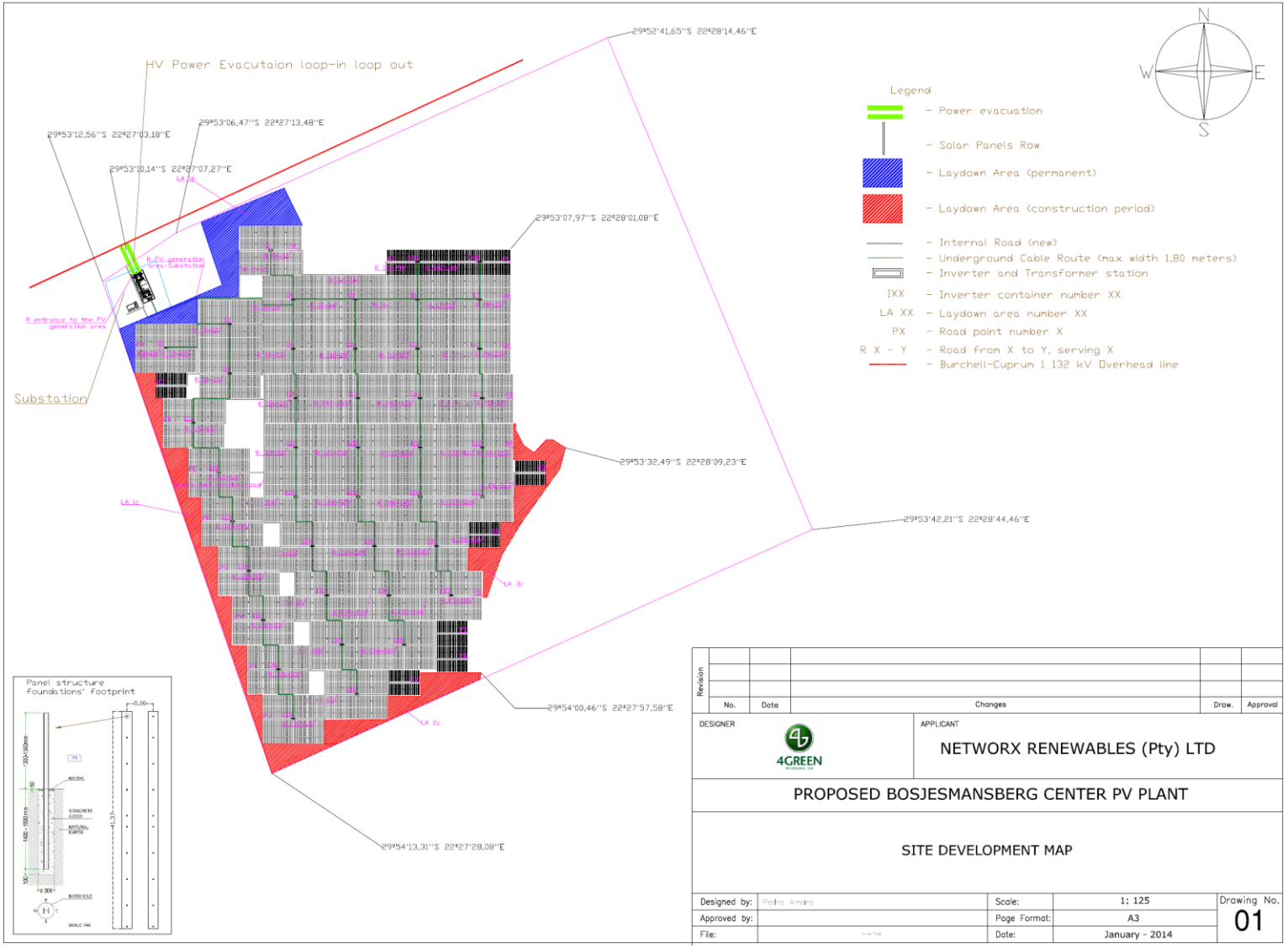

Figure 2.4: Layout for the proposed Bosjesmansberg PV Center Solar Energy Facility also indicating the location of associated infrastructure such as the substation, access roads, temporary and permanent laydown areas.

2.3. Solar Energy as a Power Generation Technology

The generation of electricity can be explained as the conversion of energy from one form to another. Solar energy facilities operate by harnessing solar energy and converting it into a useful form (i.e. electricity). Solar technologies can be divided into two categories, those that harness solar energy to create thermal energy which in turn can be converted into electricity, and those that use the electromagnetic radiation of the sun and convert it directly into electricity. The latter is known as photovoltaic (PV) technology, which is proposed for this project, and is the direct conversion of sunlight into electricity without the use of water for power generation.

The use of solar energy for electricity generation is a non-consumptive use of a natural resource. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially, and economically sustainable future. The challenge now is ensuring solar energy projects are able to meet all economic, social, and environmental sustainability criteria in terms of NEMA.

2.3.1 How do Grid Connected Photovoltaic Facilities Function?

Solar energy facilities, such as those using PV technology, use the energy from the sun to generate electricity through a process known as the Photoelectric Effect. A PV cell or solar cell is the semiconductor device that converts sunlight into electricity. These cells are interconnected to form panels which, in turn, are combined with associated structural and electrical equipment to create what are called arrays – the actual solar generation systems which connect to the energy grid. As sunlight hits the solar panel, photons can be reflected, absorbed, or pass through the panel. When photons are absorbed, they have the energy to knock electrons loose, which flow in one direction within the panel and exit through connecting wires as solar electricity.

There are several types of semiconductor technologies currently in use for PV solar panels. Two however, have become the most widely adopted: crystalline silicon and thin film. The former is constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are assembled together in multiples to make a solar panel. The latter is made by placing thin layers, hence the name thin-film, of semiconductor material onto various surfaces, usually glass. This project proposes using a thin-film PV technology which encloses the semiconductor between two sheets of glass.

A solar energy facility typically comprises the following components:

The Photovoltaic Panels: Solar photovoltaic (PV) panels consist primarily of glass and various semiconductor materials and in a typical solar PV project, will be arranged in rows to form solar arrays, as shown in Figure 2.5 The PV panels are designed to operate continuously for more than 20 years with minimal maintenance required.

Figure 2.5: Solar arrays (static technology)

The Support Structure: The photovoltaic (PV) modules will be mounted to steel support structures called tables. These can either be mounted at a fixed tilt angle, optimised to receive the maximum amount of solar radiation and dependent on the latitude of the proposed facility, or a tracking mechanism where at a maximum tilt angle of 45° the lowest part of the panel 30cm from the ground.

The Inverter: The photovoltaic effect produces electricity in direct current (DC). Therefore an inverter must be used to change it to alternating current (AC) for transmission in the national grid. The inverters convert the DC electric input into AC electric output, and then a transformer steps up the current to 33 kV for on-site transmission of the power. The inverter and transformer are housed within the power conversion station (PCS). The PV combining switchgear (PVCS), which are dispersed among the arrays, collects the power from the arrays for transmission to the project's substation.

2.4. Water Requirements and Availability

An operational PV plant does not require water for the generation of electricity. Water is required for the construction of the facility and human uses during operation. In certain instances, water is also used during operation for cleaning the panels to remove dust or dirt that builds up on the panels. A PV panel

technology which does not require water for cleaning is also commercially available.

The water requirement for the project is anticipated to be approximately 8 000 L/month/MW during the construction phase (~165 000 litres per month). Approximately 1 500 L/month/MW of water is required for maintenance (cleaning panels) during the operational phase (~112 500 litres per month and only during the months when cleaning of the solar panels is undertaken).

According to the landowner, six boreholes are located on Portion 1 of the Farm Bosjesmansberg 67. Three are located around the farmhouse structure and the other three are situated within 2km to the north, north-east and east of the farmhouse. Boreholes on the farm are currently used for stock watering purposes and the average yield of one of the boreholes is estimated to be in the region of 3 000 litres per hour (although no yield assessment has been undertaken). Water from these boreholes could potentially be available for use by the proposed project. A municipal water supply pipeline between Copperton and Prieska is situated approximately 200m north of the R357 and traverses the greater farm and presents a potential water supply resource to the project. In the case where water needs are not met by the boreholes, and/or the water supply pipeline, water will be transported onto the site for use.

Networx will be required to obtain confirmation of water availability for the project from the Department of Water Affairs (DWA), Northern Cape Region. DWA is required to provide a non-binding indication of water availability to the project. This non-binding agreement would be required for the purposes of bidding the project to the DoE. Such confirmation is only provided by DWA following selection of the project by the DoE and on final design of the facility.

2.5. Project Alternatives

In accordance with the requirements of the EIA Regulations[4], alternatives are required to be considered within any environmental impact assessment (EIA) process, and may refer to any of the following:

» Site alternatives
» Design or layout alternatives
» Technology alternatives
» The No-go alternative

[4] GNR543 27(e) calls for the applicant to identify feasible and reasonable alternatives for the proposed activity.

2.5.1 Site Alternatives

As indicated in Section 2.2.1, the land capability assessment undertaken at Scoping allowed the developer to test the merits of the site and discard other areas of the site which were under consideration due to environmental constraints. This was done within the boundaries of the greater farm and no other site alternatives (other farms) have been considered. The selection of the PV Center project site was done based on site selection criteria at Scoping.

2.5.2 Layout Alternatives

As discussed in Section 2.1.4 and Section 2.2.1, the layout of the proposed PV Center 75MW facility occupies the full extent of areas of low ecological and heritage sensitivity. The layout plan provided by the developer is therefore considered to be the most optimal layout from an environmental perspective and the need to present further layout alternatives is constrained on this basis. No feasible layout alternatives are available for assessment.

2.5.3 Technology Alternatives

As it is the intention of the developer to develop renewable energy projects as part of the DoE's REIPPP, only renewable energy technologies are being considered. Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability (i.e. solar irradiation). Solar PV was determined as the most feasible option for the proposed site as large volumes of water are not needed for power generation purposes compared to concentrated solar power technology (CSP). PV is also preferred when compared to CSP technology due to the lower visual profile.

The environmental impacts of the PV technology choices are not the same. Therefore, the selection of technology will affect environmental impacts of the proposed development. The primary differences which affect the potential for environmental impacts relate to the extent of the facility, or land-take (disturbance or loss of habitat), as well as the height of the facility (visual impacts). The impacts associated with the operation and decommissioning of the facility will be the same irrespective of the technology chosen. Two solar energy technology alternatives are being considered for the proposed project and include:

» Fixed Mounted PV systems (static/fixed-tilt panels);
» Tracking PV systems (with solar panels that rotate around a defined axis to follow the sun's movement);

Fixed Mounted PV System

In a fixed mounted PV system (fixed-tilt), PV panels are installed at a pre-determined angle from which they will not move during the lifetime of the plant's operation. The limitations imposed on this system due to its static placement are offset by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of PV panels has been shown to only marginally affect the efficiency of energy collection. There are further advantages which are gained from fixed mounted systems, including:

» The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that PV mountings include moving parts.
» Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems.
» Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.
» Fixed mounted PV systems occupy less space than the tracking systems.

Tracking PV System

Tracking PV Systems (single axis or dual axis trackers) are fixed to mountings which track the sun's movement. There are various tracking systems. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and more complex technology, which may include solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking PV panels follow the suns rotational path all day, every day of the year giving it the best solar panel orientation and thereby enabling it to generate the maximum possible output power. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance. The technology to be used will be the two alternative technologies will be assessed further in Chapter 6.

2.5.4. Grid Connection Alternatives

The power generated by PV Center will be collected and transformed at an on-site substation situated within the north-western corner of the PV Center site adjacent

to the Burchell-Cuprum No.1 132kV power line. This substation occupies an area of approximately 1ha. A loop in-loop out configuration from the on-site substation to the Burchell-Cuprum No.1 132kV power line is required.

The construction of alternative overhead distribution power lines to connect the facility to the Eskom grid is also being assessed as part of the larger project, since current grid connectivity conditions for PV Center may change in future (i.e. if the capacity on the Cuprum-Burchell 132kV power line is taken up prior to this project being developed). Two alternative power lines for evacuation of power generated by the PV Center project include:

» the construction of a new power line from the on-site substation to the existing Cuprum Substation.
» the construction of a new power line from the on-site substation to the existing Kronos Substation.

As indicated previously, these proposed power lines to the Cuprum and Kronos Substations are being **assessed under a separate Basic Assessment process** and are not further discussed or evaluated in this EIA Report. Reference to these power lines is provided in the interest of fully describing the associated infrastructure.

The on-site substation for PV Center will fall adjacent to the PV West, PV West and PV East substations. Effectively this will result in a cluster of substations concentrated within a localised area of the greater farm portion, thereby allowing for optimal connection to the grid via existing and proposed power lines as described earlier.

2.5.6. Do Nothing Alternative

The no-go option would mean that the proposed PV Center plant, as a portion of the overall 300MW Bosjesmansberg Solar Energy Facility, including all associated infrastructure would not be developed. Should this alternative be selected, there would be no impacts on the area designated for the construction of PV Center due to the associated construction and operation activities.

It is noteworthy that receipt of an environmental authorisation for the project may not necessarily result in the project being implemented due to other external factors, including whether the developers are awarded preferred bidder status by the DoE. The region surrounding Copperton has received a considerable amount of attention with respect to renewable energy facility applications. Four large renewable energy facility applications have been identified within the study area. These are the Garob Wind Energy Facility (bordering the Bosjesmansberg site to the west), the Copperton Wind Energy Facility (closer to Copperton), the Platsjambok PV Solar Energy Facility (further south) and the Klipgats Pan PV

Solar Energy Facility (south-west of the Kronos Substation). The Garob, Platsjambok and Klipgats projects have received environmental authorisations.

While the no-go alternative will have socio-economic implications at a local and broader scale, the extent of the impact is minimised by the number of PV projects proposed to be developed in the Copperton area. The do-nothing alternative will therefore likely result in minimising the cumulative impact associated with cumulative PV development in the Copperton area, although it is expected that pressure to develop the site for renewable energy purposes will be actively pursued due to the very factors which make the site a viable option for renewable energy development as discussed previously in this chapter. Other developers will likely seek to develop the site for renewable energy purposes in order to realise targets for renewable energy in the country, the socio-economic and environmental benefits of which include:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations. This translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.
» ***Exploitation of our significant renewable energy resource:*** At present, valuable national resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.
» ***Pollution reduction:*** The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar radiation for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions.
» ***Climate friendly development:*** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for approximately 1% of global

GHG emissions and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions.

» ***Support for international agreements:*** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.

» ***Employment creation:*** The sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation in South Africa.

» ***Acceptability to society:*** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

» ***Support to a new industry sector:*** The development of renewable energy offers the opportunity to establish a new industry within the South African economy.

2.6. Proposed Activities during the Project Development Stages

In order to construct each solar energy facility and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases which are discussed in more detail below.

2.6.1. Design and Pre-Construction Phase

Pre-planning: Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV array or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) Contractor who will be responsible for the overall construction phase of the project will be to comply to the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications will result. This EIA Report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be approved by the DEA. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project, the DEA will need to be notified and where relevant, approval obtained.

Conduct Surveys: Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, substation and the plant's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the

physical characteristics of soil and rocks underlying a proposed site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.6.2. Construction Phase

The construction of PV Center will be undertaken as a separate and mutually exclusive 75MW PV project from the total 300MW threshold and will be potentially bid as a stand-alone project under the DoE REIPP Programme. It therefore cannot be predicted at this stage whether the construction of this facility would correspond with the construction phase of another PV facility proposed to occur on the farm. Should this be the case, there is the opportunity to combine some of the activities discussed below.

The construction of each PV area is expected to extend over a period of approximately 18-24 months and create approximately 500 employment opportunities at peak and depending on the final design. Of this total ~ 60% (300) will be available to low-skilled workers (construction labourers, security staff etc.), 10% (50) to semi-skilled workers (drivers, equipment operators etc.) and 30% (150) to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community, representing a significant positive social benefit in an area with limited employment opportunities. The construction phase will entail a series of activities including:

Undertake Site Preparation: Site preparation involves construction of new access roads and improvement of existing on-site construction access roads with compacted native soil, installation of drainage crossings, setup of construction staging areas, storm water management work, preparation of land areas for array installation, and other activities needed before installation of the solar arrays can begin. The work would involve trimming of vegetation, selected compacting and grading, and setup of modular offices and other construction facilities.

The PV arrays require a relatively level and stable surface for safe and effective installation. Topographic, geotechnical, and hydrologic studies will be used to determine the necessary grading and compaction.

Trenching would occur within each array to bury the electrical cables. The trenches would be up to ~ 1.8m in width and 2m deep, for a total combined length of approximately 10 km. Minimal ground disturbance may occur within the trenched corridors to restore them after soil has been replaced in the trenches, so that the corridor can conform to the existing surface contours.

Establish access roads: Access roads to PV Center will be required to be constructed. The broader farm is adjacent to the R357 presenting access via an existing access road which runs parallel to the western portion of the broader farm. A new section of road of 1.5km in length and 3.5m in width is required to be constructed from this point to provide access the PV Center site boundary. Internal access roads adjacent to the on-site substation accessing the PV arrays will also be required. The length of internal roads between the PV arrays will be approximately 15km.

Transport of Components and Construction Equipment to Site: The components for the proposed facility will be transported to site by road. Some of the substation components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[5] by virtue of the dimensional limitations (i.e. size and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.), as well as the components required for the establishment of the substation and power line.

Establishment of Construction Equipment Camp: Once the required equipment has been transported to site, a construction equipment camp will need to be established for each phase. The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with each phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility at the construction camp, so as to prevent the possibility of leakages and soil contamination. It is anticipated that not more than 20 000 litres of fuel stored on site at one time for the refuelling of vehicles and machinery will be required. Fuel will be appropriately stored on site in a steel tank/s within a secured and bunded area.

Construction Crew Accommodation Camp: The majority of construction workers are likely to be accommodated in Prieska however construction crew accommodation camps may be required if accommodation in and around Copperton and Prieska is not sufficient, also considering the number of potential employment opportunities created due to other solar energy facilities proposed to be developed around the Copperton areas. The location of worker accommodation camps which may be required to be situated on site must be outside of identified sensitive areas and on agreement with the landowner and therefore cannot be mapped at this time (although are likely to be situated in

[5] A permit will be required for the transportation of these abnormal loads on public roads.

close proximity to the contractors equipment camps). Accommodation camps would be electrified and will include formalised ablution facilities, cooking facilities and waste disposal facilities.

Installation of the PV Power Plant: The construction phase involves installation of the solar PV panels and the entire necessary structural and electrical infrastructure to make each 75MW project operational. In addition, preparation of the soil and improvement of the access roads would continue throughout the majority of the construction process. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different foundation method, such as screw pile, helical pile, micropile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV modules would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the PVCS and from the PVCS to the on-site substation.

Establishment of Ancillary Infrastructure: Ancillary infrastructure for the project will include a workshop, construction and operational laydown areas and an office. Temporary construction phase laydown areas are planned to be situated between the PV panels and the site boundary to the west and south and directly adjacent to the PV panels in the east. Permanent laydown areas will be situated at the northern extent of the site between the PV array and the on-site substation. The establishment of these areas/facilities/ buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. The extent of the level to be occupied by the infrastructure is detailed in Table 2.1.

Construct on-site substation and undertake internal electrical reticulation: New internal electrical reticulation will be required in order to connect the 33/132kV on-site substation via a 150m power line to the Cuprum-Burchell 132kV power line which traverses the greater farm portion and is situated within 150m from the site boundary. Substations are constructed in the following simplified sequence:

» Step 1: Survey the area
» Step 2: Final design of the substation and placement of the infrastructure
» Step 3: Step 4: Vegetation clearance and construction of access roads (where required)
» Step 5: Construction of foundations

» Step 6: Assembly and erection of infrastructure on site
» Step 7: Connect conductors
» Step 8: Rehabilitation of disturbed area and protection of erosion sensitive areas
» Step 9: Step 10: Continued maintenance

The expected lifespan of the proposed on-site substation associated with PV Center is anticipated to be in line with the economic life of the PV project (in excess of 20 years with continued maintenance). During the life-span of the substation, on-going maintenance is performed and inspections are undertaken by Eskom.

Undertake Site Rehabilitation: As construction is completed in an area, and as all construction equipment is removed from the project site, the site must be rehabilitated where practical and reasonable.

2.6.3. Operational Phase

PV Center is expected to be operational for a minimum of 20 years, with an opportunity for a lifetime of 50 years or more with equipment replacement and repowering. The project will operate continuously, 7 days a week, during daylight hours, depending on prevailing climatic conditions. While the project will be largely self-sufficient upon completion of construction, monitoring and periodic, as needed maintenance activities will be required. Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operational phase will create 7-15 full-time employment positions. No large-scale energy storage mechanisms for the facility which would allow for continued generation at night or on cloudy days are proposed.

2.6.4. Decommissioning Phase

Depending on the continued economic viability of the facility following the initial 20year operational period, the project will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to extend the operational phase, existing components would either continue to operate or be dissembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the facility, the activities explained below will form part of the project scope.

When the project is ultimately decommissioned, the equipment to be removed will depend on the proposed land use for the site at that time. For example,

depending on the power needs at the time of decommissioning, the on-site substation could remain for use by the utility or other industrial activity.

Below is a discussion of expected decommissioning activities.

Site Preparation: Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components: All above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will either be removed, or cut off 1m below the ground surface, and the surface restored to the original contours. Much of the above ground wire, steel, and PV panels of which the system is comprised are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and can be returned to the agricultural or other beneficial land-use.

REGULATORY AND LEGAL CONTEXT CHAPTER 3

3.1 National Policy and Planning Context

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as solar energy facilities is illustrated in **Figure 3.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed Bosjesmansberg PV Center Solar Energy Facility.

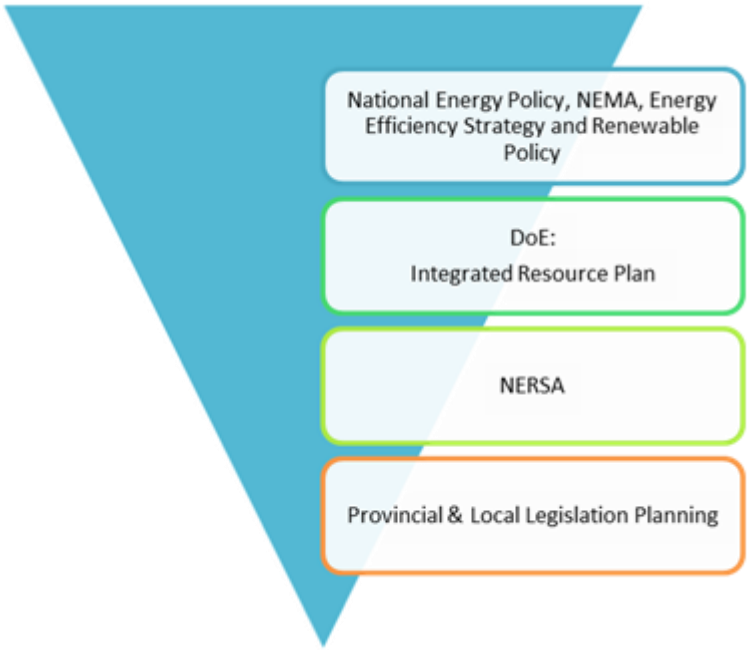

Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 The National Energy Act (2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the 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 Energy Act aims 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 and interactions amongst economic sectors, as well as matters relating to renewable energy. The Act provides the legal framework which supports the development of renewable energy facilities for the greater environmental and social good.

3.1.2 White Paper on the Energy Policy of South Africa, 1998

Development within the South African energy sector is governed by the White Paper on a National Energy Policy (DME, 1998). The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

As such, investment in renewable energy initiatives is supported, based on an understanding that renewable energy sources have significant medium - long-term commercial potential and can increasingly contribute towards a long-term sustainable energy future.

3.1.3 White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)

The White paper on renewable energy supplements the Governments overarching policy on energy as set out in its White Paper on the Energy Policy of the republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy recognizes the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The White Paper on Energy Policy's position with respect to renewable energy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

This White Paper on Renewable Energy (November, 2003) sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. South Africa relies heavily on

coal to meet its energy needs because it is well-endowed with coal resources; in particular. However South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, so far these have remained largely untapped. The White Paper on Renewable Energy sets a target of generating 10 000GWh from renewable energy sources. Therefore the policy supports the investment in renewable energy facilities sources at ensuring energy security through the diversification of supply.

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology) and more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with meeting the following challenges:

» Ensuring that economically feasible technologies and applications are implemented;
» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
» Addressing constraints on the development of the renewable industry.

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet*."

3.1.4 Final Integrated Resource Plan, 2010 - 2030

The Energy Act of 2008 obligates the Minister of Energy to develop and publish an integrated resource plan for energy. Therefore, the Department of Energy (DoE), together with the National Energy Regulator of South Africa (NERSA) has compiled the Integrated Resource Plan (IRP) for the period 2010 to 2030. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years. The IRP is intended to:

» Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;

» Ascertain South Africa's capacity investment needs for the medium term business planning environment;
» Consider environmental and other externality impacts and the effect of renewable energy technologies; and
» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

The objective of the IRP is to evaluate the security of supply, and determine the least-cost supply option by considering various demand side management and supply-side options. The IRP also aims to provide information on the opportunities for investment into new power generating projects.

The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010. The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009, and updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of the same month. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables (including 8,4GW solar); and 8.9 GW of other generation sources.

3.1.5 Electricity Regulation Act, 2006

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently awarded electricity generation licences for new generation capacity projects under the IPP procurement programme.

3.2 Provincial Policy and Planning Context

3.2.1. Northern Cape Provincial Spatial Development Framework (2011)

Dennis Moss Partnership is currently preparing a Provincial Spatial Development Framework (PDSF) for the Northern Cape Province (NCP). The PSDF is a legal requirement in terms of Chapter 4 of the Northern Cape Planning and Development Act 7 of 1998.

Volumes 1 and 2 were finalised in December 2011. Volumes 1 and 2 are essentially introductory, status quo reports. Volume 2 provides a situation analysis of the NCP, mainly with the view of identifying key aspects for policy focus/ intervention. Volumes 3 (Spatial Directives) and 4 (Strategies) are currently in preparation, and no Draft documents are available at this stage.

Volume 2 (Situation Analysis and Key Aspects) indicates that the envisaged Spatial Directives and Strategies reports would be closely aligned to the 2004-2014 Northern Cape Provincial Growth and Development Strategy (PGDS) (currently in Draft 4)[6]. Volume 2 includes an overview of some key relevant aspects of the PGDS Draft 4, including with regard to the roles of renewable energy and tourism in the provincial economy.

The PSDF (Vol 2) notes that, at present, the Eskom Vanderkloof hydro station on the Orange River (240 MW) represents the only large renewable energy-generating facility in the NCP. The PSDF therefore notes that the NCP's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change (as per PGDS). In this regard, the development of large-scale solar energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the NCP, and avoiding energy imports while minimising the environmental impacts.

The PSDF further notes that renewable energy has been identified in the Draft 4 PGDS (2011) as a mechanism to diversify the economy and thereby promote a green economy in the province. According to the PGDS, greening the economy is characterised by substantially increased investments in economic sectors (NCPG; 2011: F.1.4.1). Volume 2 of the PSDF indicates that the promotion of job creation in the green jobs industries (e.g. manufacturing of solar water heaters, maintenance of wind generators and solar energy infrastructure) would be promoted in the forthcoming spatial directives and strategies reports (Volumes 3-4). The PSDF notes that, according to the PGDS the NCP has considerable potential for renewable energy generation, including solar energy.

Tourism: The PSDF notes that the tourism sector is identified in the Draft 4 PGDS as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. According to the PGDS, the vision for tourism is underpinned by a number of broad, essential and specific drivers. The 'broad drivers' consider the 'big picture' focusing on tourism's contribution to a larger development purpose, including overall economic growth, addressing social upliftment and poverty alleviation through facilitating job creation, and striving for more equitable ownership and participation in tourism through transformation.

[6] Draft 4 (2011) of the PGDS does not appear to have been made public yet.

Comparative advantages of the NCP are identified as mainly eco- tourism opportunities, including unique sectoral or nature-based routes; National parks, nature reserves and game reserves, natural and cultural manifestations, as well as festivals and cultural events (PGNC; 2011b).

3.2.2. Siyathemba Local Municipality Integrated Development Plan

Commercial renewable energy is discussed largely within the context of the Siyathemba Local Municipality's (SLM) Local Economic Development framework (2012) and recommendations. In this regard, the Integrated Development Plan (IDP) indicates that Council has identified a solar energy incentive project as one of its major Local Economic Development (LED) activities for the current IDP period. This project would entail Council making approximately 38 000 ha available for solar energy development.

Commercial renewable energy generation and IPP projects are discussed at length in the 2013-2014 IDP Review. This is largely the result of massive interest shown by the IPP sector in the SLM area at present.

In his foreword, the Mayor, Mr. Piet Papier, notes that Council is entering the current financial period with commercial solar energy as a major new development area, with anticipated high-growth potential opportunities for local businesses, concepts, products and services. He further notes that Council potentially also stands to benefit from the use of its services (sanitation) by various solar farm developments near Copperton.

Solar energy development is specifically addressed in the context of LED. The IDP notes that Alternative Energy Development has been identified as an Anchor economic activity for the SLM. The IDP further notes that cumulatively, the anticipated Renewable Energy boom (Solar Park and IPP's), a potential associated Industrial Zone Development and new Secondary Industry Development projects in Prieska, as well as large projects like the international Square Kilometre Array (SKA) (near Vanwyksvlei in the south of the SLM), would have a major boost on the viability of the proposed Die Bos development project in Prieska. The Die Bos Holiday Resort development has been identified as a priority tourism development project for the NCP by Council, and constitutes one of the SLM's key LED projects for the 2012-2017 periods.

3.3. Regulatory Hierarchy for Energy Generation Projects

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise

control through both statutory and non-statutory instruments – that is National, Provincial and local levels. As solar energy development is a multi-sectorial issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process for solar energy facility project and the related statutory environmental assessment process.

3.3.1. Regulatory Hierarchy

At **National Level**, the main regulatory agencies are:

» *Department of Energy (DoE):* This Department is responsible for policy relating to all energy forms, including renewable energy, and is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for solar energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* SAHRA is a statutory organisation established under the National Heritage Resources Act, No 25 of 1999, as the national administrative body responsible for the protection of South Africa's cultural heritage.
» *National Department of Agriculture, Forestry, and Fisheries (DAFF):* This Department is responsible for activities pertaining to subdivision and rezoning of agricultural land. The forestry section is responsible for the protection of tree species under the National Forests Act (Act No 84 of 1998).
» *South African National Roads Agency (SANRAL):* This Agency is responsible for the regulation and maintenance of all national routes.
» *National Department of Water Affairs:* This Department is responsible for water resource protection, water use licensing and permits. This area of the Northern Cape is not generally authorised, so applications go through the National Department.
» *Eskom:* Commenting authority regarding Eskom infrastructure and grid connection.

At the Provincial Level, the main regulatory agencies are:

» *Provincial Government of the Northern Cape – Department of Environmental and Nature Conservation (NC DENC):* This Department is the commenting authority for these projects.

» *Department of Transport and Public Works:* This Department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Provincial Department of Water Affairs:* This Department is responsible for water resource protection, water use licensing and permits.
» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):* This body is responsible for commenting on heritage related issues in the Northern Cape Province.
» *Northern Cape Department of Agriculture, Land Reform and Rural Development:* This Department is responsible for all matters which affect agricultural land.
» *Northern Cape Department of Mineral Resources (DMR):* Approval from the may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.

At the local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape, both the local and district municipalities play a role. The local municipality is the Siyathemba Local Municipality which forms part of the Pixley ka Seme District Municipality. There are also numerous non-statutory bodies such as environmental non-governmental organisations (NGOs) and community based organisations (CBO) working groups that play a role in various aspects of planning and environmental monitoring that will have some influence on proposed solar energy development in the area.

3.3.2 Legislation and Guidelines that have informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this EIA Report:

» National Environmental Management Act (Act No 107 of 1998).
» EIA Regulations, published under Chapter 5 of the NEMA (GNR543, GNR544, GNR545, and GNR546 in Government Gazette 33306 of 18 June 2010).
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  * Public Participation in the EIA Process (DEA, 2010).
» International guidelines – the Equator Principles

Several other acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in the **Table 3.1. Table 3.2** provides the relevant South African environmental legislation applicable to the project in terms of environmental quality.

Table 3.1: Relevant legislative permitting requirements applicable to the proposed solar energy facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GN R543, R544, R545 and R546 of 18 June 2010, a Scoping and EIA Process is required to be undertaken for the proposed project.	Department of Environmental Affairs – competent authority Department of Environmental and Nature Conservation (DENC)- commenting authority	The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA). This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Department of Environmental Affairs	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs	Noise impacts are expected to be associated with the construction

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
		Department of Environmental and Nature Conservation (DENC)- Local Authorities	phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required). Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a	Department of Water Affairs Provincial Department of Water Affairs	A water use license (WUL) is required to be obtained if wetlands or drainage lines are impacted on, or if infrastructure lies within 500m of wetland features or the regulated area of a watercourse (being the riparian zone or the 1:100yr floodline whichever is greatest). Should water be extracted from

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	watercourse - Section 21i.		groundwater/ a borehole on site for use within the facility, a water use license will be required in terms of Section 21(a) and 21 (b) of the National Water Act. The storage of water in reservoirs may also require approval from DWA.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act. S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained. A Section 53 application will be submitted the Northern Cape DMR office.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. However, National,

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Measures to control noise (S34) - no regulations promulgated yet.		provincial and local ambient air quality standards (S9 - 10 & S11) to be considered. Measures in respect of dust control (S32) and the National Dust Control Regulations of November 2013. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38).	South African Heritage Resources Agency	An HIA and PIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix I). Should a heritage resource be impacted upon, a permit may be required from SAHRA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44).		
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002),	Department of Environmental Affairs	Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. An ecological study has been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix E.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	9 December 2011). » This Act also regulates alien and invader species.		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).	Department of Agriculture	This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. There are none for this project.
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.	National Department of Forestry	A licence is required for the removal of protected trees. No protected trees were identified for this project. Should any protected trees need to be removed, a permit will be required to be obtained from DAFF.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance Group IV: any electronic product; and Group V: any radioactive material. The use, conveyance, or storage of any hazardous	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. S(2-4) provide general principles for land development and conflict resolution.	Local Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 718), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take	National Department of Water and Environmental Affairs (hazardous waste) Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. General waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPs for each Phase (refer to Appendix K-M). The DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste will also need to be considered. The volumes of solid waste to be

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds). The contractor's camp will result in sewage and grey water handling. Sewage is regarded as hazardous waste in terms of this Act. However the volume of hazardous waste generated from the construction and operation of the facility will not exceed the specified threshold volumes within the Waste Act (i.e. an annual throughout capacity of 2000m^3) and therefore a waste license from National DEA will not be required.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the country	Department of Agriculture	Subdivision of land may be required in terms of S24 and S17 of the Act.
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
Provincial Legislation			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely	Northern Cape Department of Environment and Nature Conservation	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant species found on site. Additionally, a permit for the disturbance or destruction of indigenous species must be applied for.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province.		

APPROACH TO UNDERTAKING THE EIA PHASE CHAPTER 4

The EIA process for the proposed PV Center facility is regulated by the EIA Regulations of June 2010 (as amended), which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts (both positive and negative) associated with a proposed project. The EIA process forms part of the feasibility studies for a project, and comprises a Scoping Phase and EIA Phase which culminates in the submission of an EIA Report together with an Environmental Management Programme (EMPr) to the competent authority for decision-making.

The EIA process for the proposed PV Center facility has been undertaken in accordance with the EIA Regulations in terms of Sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR544; GNR545; and GNR546 of Section 24(5) of the National Environmental Management Act (NEMA Act No. 107 of 1998). In line with the EIA Regulations, an application for authorisation was lodged with the National DEA for each phase of the project. The Scoping Report for the larger 300MW PV facility was recently accepted by DEA. In terms of this acceptance of scoping and the DEA's guidance regarding the split of the application, an EIA phase study (separate EIA and specialist reports) was required to be undertaken for each 75MW PV project.

4.1. Scoping Phase

The entire extent of Portion 1 of the Farm Bosjesmansberg 67 was evaluated within the Scoping report. No environmental fatal flaws were identified to be associated with the broader site through this process. This scoping report was accepted by the DEA in February 2013.

The scoping phase served to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

4.2. Environmental Impact Assessment Phase

The EIA Phase for PV Center aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed phases put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facilities.
» Comparatively assess any alternatives put forward as part of the projects.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative[7] impacts (both positive and negative) associated with all phases of the project including design, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

4.2.1. Tasks completed during the EIA Phase

The EIA Phase for the proposed Bosjesmansberg PV Center project has been undertaken in accordance with the EIA Regulations published in GN 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of GN R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.
» Prepare a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).

[7] "Cumulative environmental change or cumulative effects may result from the additive effect of individual actions of the same nature or the interactive effect of multiple actions of a different nature" (Spaling and Smit, 1993).

» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

4.2.2 Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultation undertaken is included within this EIA report. Consultation with the regulating authorities (i.e. DEA and Northern Cape DENC) has continued throughout the EIA process. On-going consultation included the following:

» The Final Scoping Report for the Bosjesmansberg Solar Energy Facility (300MW project) together with a Plan of Study for the EIA phase, were submitted and accepted by DEA in February 2014
» Permission to split the 300MW facility into individual 75MW applications was granted by the DEA 6 February 2014.

The following will also be undertaken as part of this EIA process:

» Submission of a final EIA Report to DEA following a public review period for the draft EIA (30 days) and final EIA report (21 days).
» If required, an opportunity for DEA and NC DENC representatives to visit and inspect the proposed site, and the study area.
» Notification and Consultation with Organs of State that may have jurisdiction over the project, including:
  * Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc.).
  * Government Structures (listed in Table 4.1)

A record of the authority consultation in the EIA process is included within **Appendix B**.

4.2.3 Public Involvement and Consultation

The aim of the public participation process is primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.

» Comments received from stakeholders and I&APs were recorded and incorporated into the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities for stakeholders and I&APs to be involved in the EIA Phase of the process have been provided, as follows:

» Focus group meetings and a public meeting (pre-arranged and stakeholders invited to attend - for example with directly affected and surrounding landowners).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.
» The Draft EIA Report was released for a 30-day public review period from 19 February 2014 – 20 March 2014: The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the authorities for decision-making.
» The Final EIA report will be released for a 21-day public review period.

In terms of the requirement of Chapter 6 of the EIA Regulations of June 2010, the following public participation tasks have been undertaken:

» Distribution of Letters of Notification to I&APs to inform them on the changes in the project and planned EIA phase.
» Fixing a notice board at a place conspicuous to the public at the boundary or on the fence of—
    (i) the site where the activity to which the application relates is or is to be undertaken; and
    (ii) any alternative site mentioned in the application;
» Giving written notice to:
    (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
    (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
    (iii) Owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
    (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
    (v) the municipality which has jurisdiction in the area;

(vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
(vii) any other party as required by the competent authority.

» Placing an advertisement in:
(i) one local newspaper; and
(ii) in at least one provincial newspaper.
» Open and maintain a register/ database of interested and affected parties and organs of state.
» Release of a Draft EIA Report for Public Review for a 30-day period.
» Hosting of a Public Meeting and Focus Group Meetings by the EAP to discuss and share information on the project.
» Preparation of a Comments and Responses Report which document all the comments received and responses from the project team.
» Apart from the 30 day commenting period on the Draft EIR, in order to give effect to Regulation 56(2), registered Interested and Affected parties will be given access to, and an opportunity to comment on the final report in writing within 21 days before submitting the final environmental impact assessment report to the DEA.

Below is a summary of the key public participation activities conducted up to this point in the process.

» **Placement of Site Notices**
Site notices have been placed on-site and at relevant public places and proof of this is included in Appendix D.

» **Identification of I&APs and establishment of a database**
Identification of I&APs was undertaken by Savannah Environmental through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.1 below).

Table 4.1: Key stakeholder groups identified during the EIA Process

Stakeholder Group	Department
National and Provincial Authorities	» Northern Cape – Department of Environmental and Nature Conservation (DENC) » Northern Cape - Agriculture and Rural Development » Northern Cape - Public Works, Roads and Transport » Northern Cape - Water Affairs » South African Heritage Resources Agency » Department of Agriculture, Forestry and Fisheries » South African National Roads Agency

Stakeholder Group	Department
	» Department of Energy » Civil Aviation Authority » Square Kilometre Array (SKA) Project
Municipalities	» Siyathemba Local Municipality » Pixley ka Seme District Municipality
Public stakeholders	» Landowners, surrounding landowners, occupiers of land, farmer's unions.
Parastatals & service providers	» Eskom Transmission and Distribution » Ngwao Boswa ya Kapa Bokone (Northern Cape Provincial Heritage Authority)
NGOs/Business forums	» Wildlife Environment Society of South Africa » BirdLife South Africa

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C). While I&APs were encouraged to register their interest in the project from the onset of the process undertaken by Savannah Environmental, the identification and registration of I&APs has been on-going for the duration of the EIA phase of the process.

» **Newspaper Advertisements**
Newspaper adverts was placed to inform the public on the availability of the draft EIA Report and application split in the following newspapers:
* Volksblad (week of 17 February 2014)
* Gemsbok (week of 17 February 2014)

Refer to Appendix D for proof of advertisements which were placed.

» **Consultation**
In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA phase, including:

* Focus group meetings (stakeholders invited to attend)
* Public meeting (advertised in the local press)
* Written, faxed or e-mail correspondence

» In order to further facilitate comments on the Draft EIA report and to provide feedback on the findings of the specialist scoping studies, a public feedback meeting will be held and interested and affected parties will be invited to attend the public meeting. Details of the meeting will be advertised in the Volksblad and Gemsbok newspapers.

Records of all consultation undertaken are included within **Appendix D**.

4.2.4 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process will be synthesised into an EIA Phase Comments and Response Report. The Comments and Response Report will include responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

4.2.5 Assessment of Issues Identified through the Scoping Process

Issues which require investigation within the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 4.2 below.

Table 4.2: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
Ecological Impact Assessment	Simon Todd Consulting	Appendix E
Soils and Agricultural Potential Assessment	Johann Lanz Soil Scientist	Appendix F
Visual Impact Assessment	Lourens du Plessis of MetroGIS	Appendix G
Social Impact Assessment	Tony Barbour	Appendix H
Heritage Impact Assessment	Archaeological Contracts and Heritage Consulting (HCAC)	Appendix I
Palaeontology specialist statement	Dr John Almond of Natura Viva	Appendix J
Avifaunal Impact Assessment	Dr Doug M. Harebottle	Appendix K

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed PV Center project. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1

- The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
- Medium-term (5–15 years) – assigned a score of 3
- Long term (> 15 years) - assigned a score of 4
- Permanent - assigned a score of 5

» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
- 0 is small and will have no effect on the environment
- 2 is minor and will not result in an impact on processes
- 4 is low and will cause a slight impact on processes
- 6 is moderate and will result in processes continuing but in a modified way
- 8 is high (processes are altered to the extent that they temporarily cease)
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes

» The **probability of occurrence**, wh0ich describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
- Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
- Assigned a score of 2 is improbable (some possibility, but low likelihood)
- Assigned a score of 3 is probable (distinct possibility)
- Assigned a score of 4 is highly probable (most likely)
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high

» The **status**, which is described as either positive, negative or neutral

» The degree to which the impact can be reversed

» The degree to which the impact may cause irreplaceable loss of resources

» The degree to which the impact can be mitigated

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft EMP is included as **Appendix L**.

4.2.6 Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed solar facility.
» It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices E – K** for specialist study specific limitations.

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

This section of the EIA Report provides a description of the environment of the greater farm portion as well as the specific site within the greater farm portion that may be affected by the proposed PV Center 75MW project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as site investigations, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within **Appendices E - K**.

While this chapter focusses on the description of the environment for PV Center, the relevant differences between PV Center and the other 75MW projects proposed to occur on Portion 1 of the Farm Bosjesmansberg 67 are summarised where applicable to assist the reader in understanding the differences between each of the four projects.

5.1 Topography

Regionally, the site for the proposed Bosjesmansberg PV Center Solar Energy Facility is located approximately 30km south-west of Prieska and 16km east of Copperton in the Northern Cape.

The regional study area occurs on land that ranges in elevation from about 920m above mean sea level (AMSL) along the Orange River (located just north-east of Prieska) to about 1360m AMSL at the top of the Doringberge in the north-east of the study area. With these mountains as the highest point, the topography slopes to the north east (towards the river) and to the south west. The site itself lies at an elevation of about 1130 – 1251m AMSL.

The topography consists of slightly irregular plains and hills. The Doringberge lie in the far north east of the study area, and some smaller local hills are situated on the site and immediately north-east of the site. Other than these hills, the rest of the site is relatively flat.

The most significant hydrological feature within the region is the Orange River, which lies just beyond of the town of Prieska in the north east. A few non-perennial tributaries are present in the study area. A single pan is situated in the boundaries of the PV Center site.

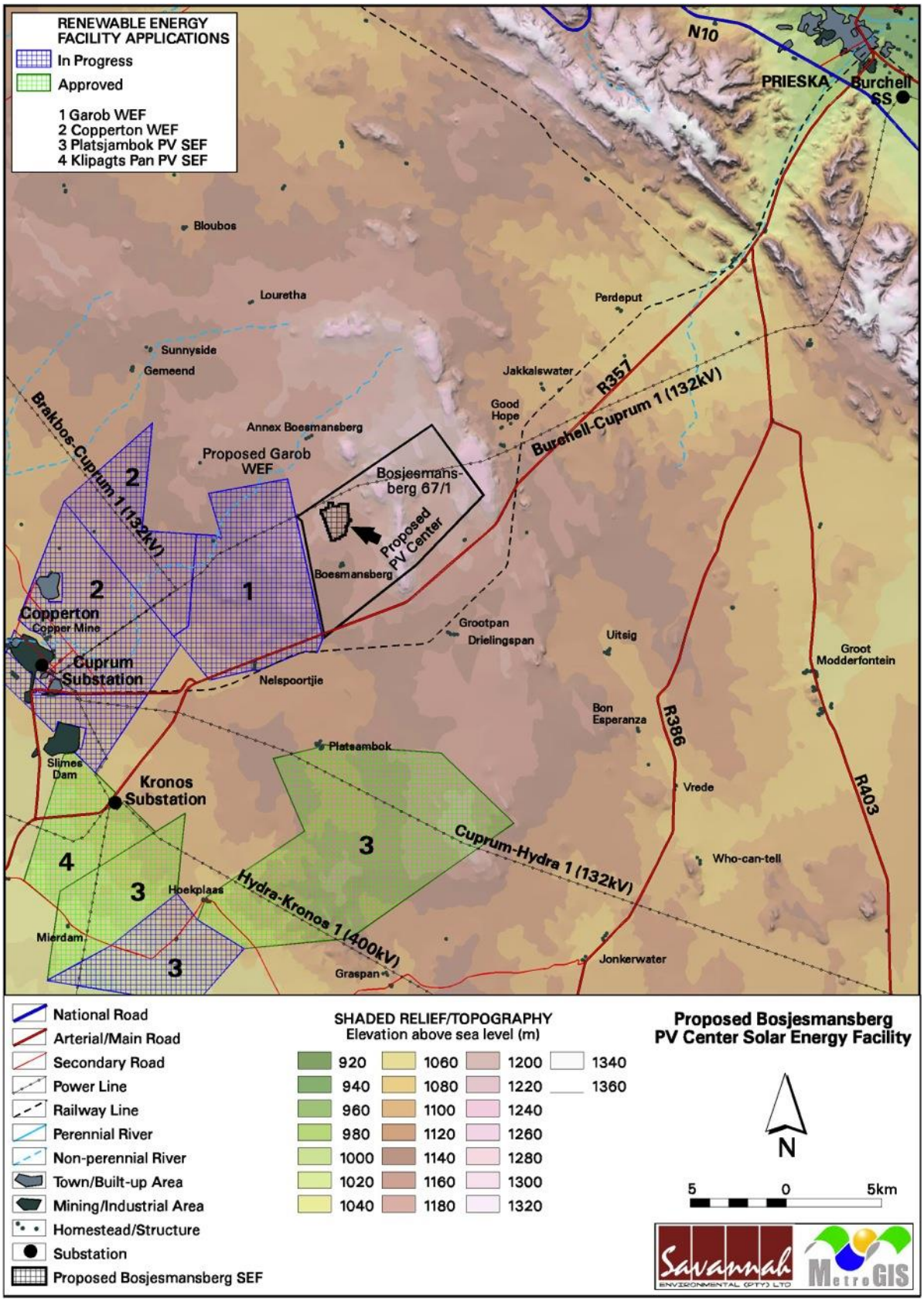

Figure 5.1: Topographic map indicating the position of the PV Center site relative to other renewable energy facilities (approved and in process)

5.2 Geology

The Copperton area is largely underlain near-surface by unconsolidated aeolian (i.e. wind-blown) sands of the Quaternary Gordonia Formation (Kalahari Group) (Qg) whose thickness in the study region is uncertain. A narrow north-south trending inlier of Permocarboniferous glacial sediments of the Dwyka Group (C-Pd, Karoo Supergroup) is mapped in the northwest corner of the study site and similar rocks probably underlie the thin, superficial cover of Gordonia sands elsewhere within the study site. Dwyka rocks may therefore be intersected by deeper excavations during development. Numerous small inliers of ancient Precambrian basement rocks with a predominantly north-south trend also emerge through the cover of Kalahari sands in the Copperton study area. Metasedimentary basement rocks to the northeast of the NW-SE striking Brakbosch fault line running past Copperton are assigned to the Uitdraai Formation of the Brulpan Group (Mu).

5.3 Climate

Rainfall in the area averages 210 mm per annum, according to the South African Rain Atlas (Water Research Commission, undated). Rainfall is highest between the months of November and March with the highest rainfall typically experienced in March (42mm). In terms of the relationship between rainfall and evaporation the site is classified as arid. Temperatures peak in December, January and February with daytime highs averaging 36°C while daytime lows average 21°C in the winter months of June and July.

5.4 Land-Use and Status

The greater farm is located within a sheep farming agricultural region. There has never been any cultivation or irrigation on the PV Center site. The only agricultural infrastructure include fenced camps where livestock watering is conducted. There is no evidence of significant soil erosion or other degradation on the farm.

5.5 Conservation Planning - Critical Biodiversity Areas

No fine-scale conservation planning has been conducted in the area and so no Critical Biodiversity Areas have been defined for the region. However, there is a relatively small National Protected Areas Expansion Strategy Focus Area to the south of the site, to the south of the R357. NPAES focus areas are areas that are considered important for the expansion of the land-based protected area network as they contribute towards meeting biodiversity thresholds for terrestrial or freshwater ecosystems, maintaining ecological processes or climate change resilience. The affected NPAES focus area is a part of the Gariep focus area, the majority of which lies to the north and east of the farm. The development would

not be likely to impact the NPAES focus area and its presence in the area is not considered to be a significant concern.

5.6 Regional floristic description

5.6.1 Broad scale vegetation patterns

According to the national vegetation map (Mucina & Rutherford 2006) two vegetation types occur within the greater farm portion, Bushmanland Arid Grassland and Lower Gariep Broken Veld. Bushmanland Arid Grassland is the second most extensive vegetation type in South Africa and occupies an area of 45478 km^2 and extends from around Aggeneys in the east to Prieska in the west. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300 mm deep. Due the arid nature of the unit which receives between 70 and 200 mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact and its' conservation status is classified as Least Threatened. Mucina & Rutherford (2006) list 6 endemic species for the vegetation type which is relatively few given the extensive nature of the vegetation type.

The low hills and ridges of the broader farm are classified as Lower Gariep Broken Veld. Lower Gariep Broken Veld occupies an area of 4538 km^2 along the hills, mountain and rocky plains along the Orange River from Onseepkans in the west to as far as Prieska in the east. Less than 1% of Lower Gariep Broken Veld has been transformed and about 4% is conserved within the Augrabies Falls National Park and it is classified as Least Threatened. According to Mucina and Rutherford (2006) the only endemic species known from this vegetation unit is the succulent shrub *Ruschia pungens*. This is however dubious given that the species occurs in the Eastern Cape and is classified as DDT by the Red List of South African Plants (2012). There are however a variety of listed and protected species that are associated with this vegetation type.

There are a number of other vegetation types present in the wider area, of which Bushmanland Basin Shrubland is of relevance to the current study as both the Caprum and Kronos substations are located within this vegetation type. Bushmanland Basin Shrubland is also among the most extensive vegetation types in South Africa with an extent of 34 690 km^2. Bushmanland Basin Shrubland occurs on the extensive basin centered on Brandvlei and Van Wyksvlei, spanning Granaatboskolk in the west to Copperton in the east, and Kenhardt in the north to around Williston in the south. The area is characterised by slightly irregular plains dominated by dwarf woody shrubs, with succulent shrubs or perennial grasses in places. The geology consists largely of mudstones and shales of the Ecca group and Dwyka tillites with occasional dolerite intrusions. Soils are largely shallow to

non-existent, with calcrete present in most areas of the greater farm portion. Rainfall ranges from 100-200mm and falls mostly during the summer months as thunder storms. As a result of the arid nature of the area, very little of this vegetation type has been affected by intensive agriculture and it is classified as Least Threatened. There are few endemic and biogeographically important species present at the site and only *Tridentea dwequensis* is listed by Mucina and Rutherford as biogeographically important while *Cromidon minimum*, *Ornithogalum bicornutum* and *O.ovatum* subsp *oliverorum* are listed as being endemic to the vegetation type.

5.6.2 Fine scale vegetation patterns

The following habitat types were determined to be present within the PV Center project site, and the extent of each is shown in Figure 5.6:

a) Calcrete Shrubland – 57% cover of PV Center

Although the majority of the site is mapped as Bushmanland Arid Grassland, a large proportion of the vegetation mapped as this vegetation type consist of calcrete plains dominated by low shrubs widely associated with calcrete soils across the karoo. This habitat type corresponds to the Northern Upper Karoo vegetation type of Mucina & Rutherford (2006), which although not mapped within the site, occurs to the southeast of the site.

Dominant and characteristic species include low shrubs such as *Pentzia incana*, *Rosenia humilis*, *Pegolettia retrofracta*, *Ruschia divaricata*, *Thesium hystrix*, *Zygophyllum lichtensteinianum*, *Lycium cinereum*, *Salsola tuberculata*, grasses such as *Fingerhutia africana*, *Enneapogon desvauxii*, *Stipagrostis obtusa* and *Oropetium capense*. This habitat type is generally very homogenous and the open plains may be occasionally interrupted by *Lycium pumilum* and *Phaeoptilum spinescens* in areas receiving some runoff or by dense patches of *Rhigozum trichotomum* in areas with deeper soils.

Species of interest and concern observed within this habitat type include *Hoodia gordonii*, *Aloe claviflora* and *Titanopsis calcarea*. *Aloe claviflora* and *Titanopsis calcarea* are also present. The density of these species is however low and this habitat type is not considered highly sensitive.

Figure 5.2: Photograph illustrating the terrain and vegetation associated with Calcrete shrublands

b) Arid grasslands (or Grassy Shrubland) – 39% cover of PV Center

Within the context of the site, Arid Grassland corresponding to the Bushmanland Arid Grassland vegetation type of Mucina & Rutherford (2006) is usually associated with deeper red Aeolian sands, which tend to accumulate at the base of the rocky hills and along drainage depressions. As such, this habitat type is relatively restricted at the site and contrary to the national vegetation map is not the dominant vegetation type at the site.

This habitat type is usually dominated by perennial grasses and the density of the shrub layer varies with soil depth, with areas of deep sands being dominated by grasses with very few shrubs present, while more shallow or finer-textured soils contain a higher proportion of woody shrubs with species such as *Rhigozum trichotomum*, *Phaeoptilum spinosum* and *Lycium horridum* being particularly prominent. The dominant grasses include *Stipagrostis ciliata*, *Stipagrostis obtusa*, *Stipagrostis anomala* and *Eragrostis lehmanniana*, while other low shrubs present include *Plinthus karooicus*, *Chrysocoma ciliata* and *Melolobium candicans*. As this habitat type occurs along the base of the rocky hills, the density of *Boscia albitrunca* is relatively high in these areas. Along the eastern margin of PV Center, there are some areas of deeper sandy soils, which have a higher abundance of species of conservation concern including *Boscia albitrunca*, as well as *Hoodia gordonii*, *Hoodia flava* and *Harpagophytum procumbens*.

Due to the general proximity of this habitat type to the rocky hills the higher abundance of species of conservation concern it is considered of moderate sensitivity, lying between the lower sensitivity calcrete plains and the higher sensitivity rocky hills.

Figure 5.3: Photograph illustrating the terrain and vegetation associated with Grassy shrubland

c) Pans – 1% cover of PV Center

There is a pan situated within the northern section of the site, within 120m from the northern site boundary and 120m from the nearest PV array. The pan is relatively small, being about 20m across with an additional 10m of fringing vegetation. This pan is dominated by *Sporobolus fimbriatus* with a taller woody layer of *Lycium pumilum* and *Phaeoptilum spinosum*. Due to the ecological significance of the pan, it is considered highly sensitive and no development should take place within 100m from the pan to maintain the integrity of ecological functioning of the pan.

Figure 5.4: Photograph illustrating the terrain and vegetation associated with Pan occurring in PV Center

d) Washes and drainage lines – 3% cover of PV Center

Due to the low rainfall and sandy soils around the base of the rocky hills, there are few well developed drainage lines occurring over the farm. Within the rocky hills, the drainage lines are well wooded with species such as *Acacia mellifera*, *Boscia*

albitrunca and *Lycium oxycarpum*, while on the open plains, they may be more open, with grasses and *Lycium pumilum* along the banks. Of interest is that a large population of the protected bulb species *Ammocharis coranica* was observed within the drainage lines among the rocky hills between PV Center and PV East. The populations numbered several hundred individuals and it is fairly unusual to find such a large aggregation in this area. This population should not be impacted by the development, either from any access roads through this area or from other infrastructure. Apart from *Ammocharis coranica* and *Boscia albitrunca*, the only other listed or protected species observed along the drainage lines was *Boophone disticha* which was observed along the banks of the sandy bed. Due to the poorly developed nature of drainage lines on the farm, two categories of drainage are recognised, being:

» well-developed drainage lines which are defined by a recognisable channel and usually with associated woody vegetation, and
» washes which are broad areas which receive runoff during large runoff events, but do not have a defined channel and are considered to be less sensitive than actual drainage lines.

Figure 5.5: Photograph illustrating the terrain and vegetation associated with the dry drainage line occurring in the south of the site and large population of *Ammocharis coranica* that was observed

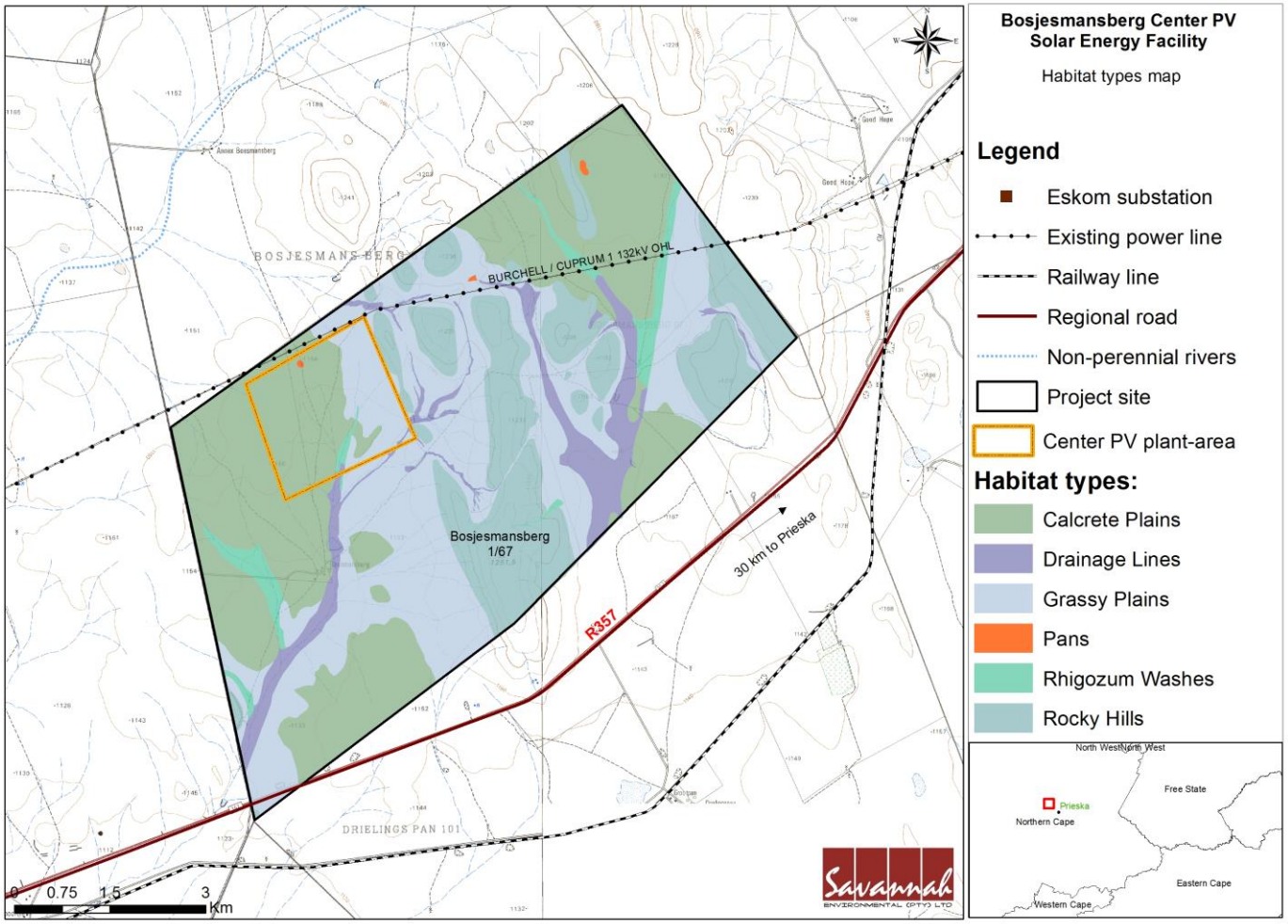

Figure 5.6: Fine scale vegetation patterns illustrating the habitat types present on Portion 1 of the Farm Bosjesmansberg 67, and specifically the PV Center Project development site

5.6.3 Plant species of conservation concern

Two red data-listed plant species are known from the area, *Hoodia gordonii* which is listed as DDD (data deficient, insufficient information) and *Salsola apiciflora* which is listed DDT (Data Deficient – Taxonomically Problematic). There are however a variety of nationally or provincially protected species which can be confirmed present at the site. Within the sandy areas, such as along the eastern edge of PV Center, the geophytic herb *Harpagophytum procumbens* was common. This species is protected at the national and provincial level on account of its' popularity as a medicinal plant. It is however not rare and the population is estimated at several million plants. Affected individuals can be translocated as their survival probability is high. Other protected species observed at the site include *Hoodia gordonii*, *Hoodia flava* and *Titanopsis calcarea*, *Pachypodium succulentum*, *Mestoklema tuberosum*, *Aloe claviflora* and *Avonia ustulata*. No protected species were particularly abundant within the proposed development areas and it is highly unlikely that the development of the site would significantly impact the local populations of the any of the listed species.

Table 5.1. Numbers of the species within the different conservation status categories as indicated below, data derived from the SANBI SIBIS database for the area. Species not evaluated are largely alien species and species no longer recognised as valid.

Status/ IUCN Red List Category	No. Species
Critically Endangered (CR)	0
Endangered (EN)	0
Vulnerable (VU)	0
Near Threatened (NT)	1
Critically Rare	0
Rare	0
Declining	1
Data Deficient - Insufficient Information (DDD)	3
Data Deficient - Taxonomically Problematic (DDT)	0
Least Concern	265
Not Evaluated	44
Total	**314**

5.6.4 Comparison to other PV 75MW sites proposed for development

The habitat types dominant in each of the 75MW project areas and their associated sensitivity based on Figure 5.5 is indicated in Table 5.2 below. Evident from this table is that:

» The habitats most defined within PV Center are the Calcrete Shrublands of low sensitivity and Grassy Shrublands of medium sensitivity.
» PV Center has the highest proportion of drainage lines and washes occurring within its boundaries.
» A pan exists in PV Center

The layout for PV Center, as will be shown later in this report avoids all of the abovementioned areas (and associated buffers), including these areas as no-go areas.

Table 5.2: Habitat types and associated sensitivity within the four 75MW areas

Habitat Type	Sensitivity	PV East	PV Center	PV West	PV South
Calcrete Shrubland	Low	88%	57%	98%	80%
Grassy Shrubland	Medium	-	39%	-	20%
Pans	Very High	2%	1%	-	-
Washes and drainage lines	High to Very High	-	3%	2%	-
Rocky Hills	Medium - High	10%	-	-	-

5.7 Faunal communities

5.7.1 Mammals

The greater farm lies within the range of 43 terrestrial mammals, including two listed species. The listed species are the Black-footed cat *Felis nigripes* (VU) and Honey Badger *Mellivora capensis* (SA RDB EN). Both these species have a wide distribution in South Africa and the development would not be likely to result in a significant overall decline in the available habitat for these species. At a local level, there is likely to be some impact on listed species if present. However as these are secretive animals which occur at a low density, it is likely that affected individuals would still be able to utilise the majority of the site. In addition, the open plains are not optimal habitat for these species and the mosaic of rocky hills and more open grassland is likely to provide the best combination of cover and prey availability for these species. As this habitat will not be affected by the development, it is likely that the impact on the listed species would be low.

Faunal abundance at the site was quite high and a wide array of species was directly or indirectly observed. The majority of species observed were medium sized mammals, typical of farmland and no particularly rare or notable species were observed. Species that were observed at the site during the site visit include Cape Porcupine *Hystrix africaeaustralis*, Steenbok *Raphicerus campestris*, Springbok

Antidorcas marsupialis, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Cape Hare *Lepus capensis*, South African Ground Squirrel *Xerus inauris*, Namaqua Rock Mouse *Aethomys namaquensis*, Black-backed Jackal *Canis mesomelas*, Bat-eared Fox *Otocyon megalotis*, Yellow Mongoose *Cynictis penicillata* and African Wild Cat *Felis silvestris*.

5.7.2 Reptiles

According to the distribution maps available in the literature, as many as 39 reptiles could occur on the greater farm portion. However, according to the SARCA database 53 species have been recoded within the degree squares 2922 and 3022, indicating that the reptile diversity in the broad area is fairly high. However, within the four quarter degree squares nearest the site, only 29 species have been recorded. Although the area has probably not been well sampled in the past, the latter is the most realistic estimate of the reptile species richness at the site. Reptile activity at the site during the site visit was relatively high, but only three species accounted for all the sightings, this included the Rock Monitor *Varanus albigularis*, Spotted Sand Lizard *Pedioplanis lineoocellata* and Burchell's Sand Lizard *Pedioplanis burchelii*. The rocky hills to the east of PV Center are likely to contain the highest abundance and diversity of reptiles on account of the higher habitat diversity, cover and prey abundance. Only one listed species is known from the broad area, the Karoo Padloper *Homopus boulengeri* (Near Threatened). Although this species may be present, it was not observed during the site visit and if it occurs at the site, would be present at a low density.

5.7.3 Amphibians

Although 14 frog species are known from the broad area around the site, frog diversity within the site is likely to be considerably lower. A large proportion of the species known from the area are associated with the Orange River to the north-east of the site and require perennial water. Although there was water in one of the pans at the site, no amphibians were observed here or anywhere else at the site. As there is very little perennial water at the site, water-dependent species are not likely to be present or abundant in the area. The small pans at the site are shallow and although they would provide breeding habitat for species which use temporary water sources for breeding purposes such as the Karoo Toad, they are not likely to hold water for long enough to be attractive for water-dependent species. As a result, species likely to occur at the site are likely to include those which are relatively independent of perennial water such as the Karoo Toad *Vandijkophrynus gariepensis*, Common Caco *Cacosternum boettgeri* and Tandy's Sand Frog *Tomopterna tandyi*. Only one listed species is known from the area, the Giant Bullfrog *Pyxicephalus adpersus* which is listed as Near Threatened. This species is known from areas to the east of the site, but breeds in ephemeral pans and the

small pans identified at the site are probably too small for this species and do not contain suitable aestivating habitat in their vicinity.

5.7.4 Avifauna

Overall, the avifauna comprises a rich Nama-Karoo assemblage which reflects the major habitat types within the area. Based on atlas data from the first (SABAP1) and second (SABAP2) bird atlas projects, up to 171 species can be recorded within the general area of the proposed facility. On a finer scale, at least 103 species can be recorded within a 10 km radius, while a field survey during December 2013 conducted by the avifaunal specialist produced a list of 62 species occurring within the greater farm portion. Ten Red Data species and 59 southern African endemics or near-endemics have been recorded within the three Quarter-Degree Grid Cells in which the proposed PV Center is located. These include three Red Data species (Ludwig's Bustard, Martial Eagle and Lanner Falcon) and 26 southern African endemics/near-endemics.

Conservation worthy avifaunal species in the greater area: The most conservation worthy and impact susceptible species recorded for the greater area include the Kori Bustard, Ludwig's Bustard, Blue Crane Secretarybird, Martial Eagle, Black Harrier, Northern Black Korhaan and Karoo Korhaan. These species are highly susceptible to habitat disturbance and/or to collisions and electrocution from overhead power lines. Other priority species likely to be impacted over the larger farm portion include Lanner Falcon, Greater Kestrel, Spur-winged Goose, Namaqua Sand Grouse and White-browed Sparrow-weaver.

Conservation worthy avifaunal species in PV Center: The only conservation worthy species noted within PV Center was the Namaqua Sand Grouse, the flight path of which was observed as being between the farm dam located near to the farm house and PV Center. The White-browed sparrow weaver was found to be resident within the greater farm portion, but not within PV Center. Similarly the Ludwigs Bustard is present on the farm but was not found to be present within PV Center. It is likely that all the conservation worthy species will visit PV Center from time to time in search of food.

5.8 Soils

There are three land types across PV Center being Ag137, Ag154 which covers the majority of the site and Ic50 to a limited extent on the eastern boundary (the latter being non-utilisable, wilderness lands). Soils across the site are generally extremely shallow to shallow, red, sandy soils on underlying rock or calcrete with deeper soils occurring in patches. There is no evidence of significant soil erosion or other soil degradation on the site.

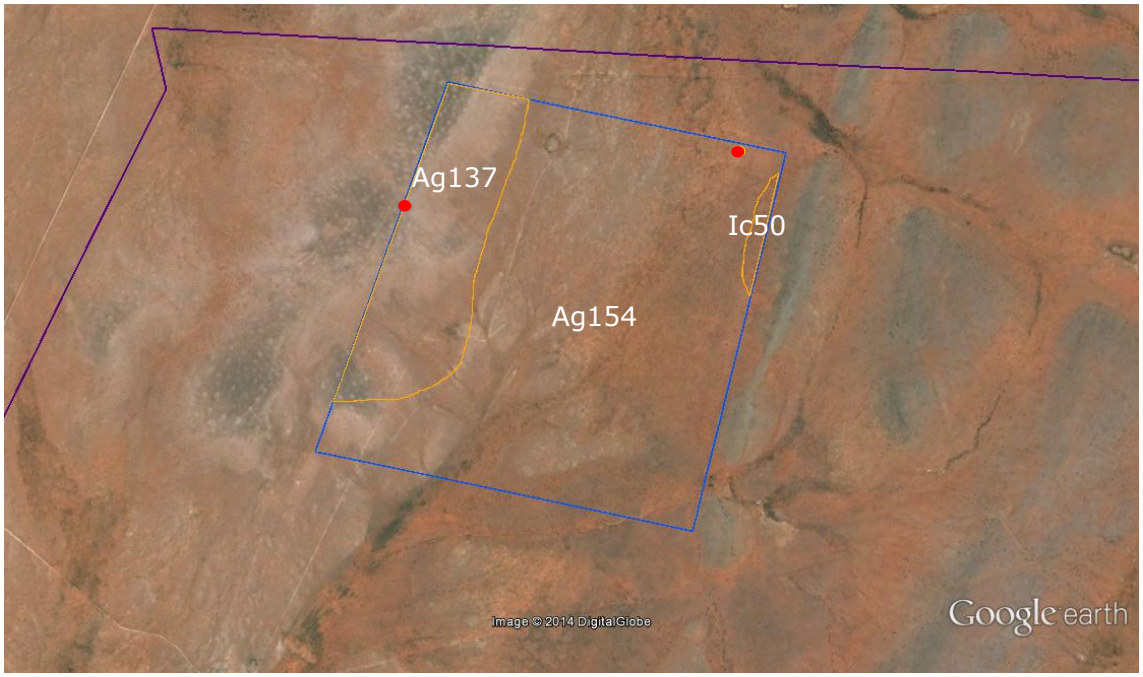

Figure 5.6: Land types (orange) mapped across PV Center (blue boundary) and soil sample points (red dots)

5.9 Agricultural Potential

According to the Agricultural Geo-referenced Information System (AGIS), the land is classified as having a grazing capacity of 26-30 hectares per animal unit. The major limitations to agriculture are the aridity and the shallow soils limited in depth by rock and calcrete. Because of the aridity and soil constraints the only possible agricultural land use is small stock grazing. Water for stock watering points is obtained from boreholes on the farm. There is no water available for irrigation, and no irrigated land on the farm.

5.10 Surface Water Resources

Due to the low rainfall and sandy soils around the base of the rocky hills, there are few well developed drainage lines on the greater farm. Due to the poorly developed nature of drainage lines on the greater farm, two categories of drainage are recognised, which are:

» well-developed drainage lines which are defined by a recognisable channel and usually with associated woody vegetation, and
» washes which are broad areas which receive runoff during large runoff events, but do not have a defined channel and are considered less sensitive than actual drainage lines.

One small pan is located on the site. The pans is approximately 20m in diameter with an additional 10m of fringing vegetation. The small pan within PV Center is

dominated by *Sporobolus fimbriatus* with a taller woody layer of *Lycium pumilum* and *Phaeoptilum spinosum*. This pan did not contain water at the time of the ecological survey.

5.11 Groundwater

PV Center is situated in the drainage region D of the quaternary sub-catchment D54D where low rainfall and high evaporation of surface water are a key feature of the area. Consequently, groundwater systems via boreholes should form a key water source in the area. Based on discussions with the landowner, there are six boreholes on the greater farm portion which are used extensively.

Sheet flow can be defined as an overland flow or downslope movement of water taking the form of a thin, continuous film over relatively smooth soil or rock surfaces and not concentrated into channels larger than rills. There is a defined drainage line starting in the southern section of PV Center. Drainage would occur as sheet flow before being channelled into this system.

5.12 Air quality

It can be assumed that air quality in the area is good based on the extremely limited presence of industrial activity in the greater district. The low groundcover levels in the vicinity, and agricultural activities combined with relatively windy conditions for much of the year mean that dust is likely to affect air quality.

Dust deposition levels in the vicinity are slight based on the DEA dust deposition categories, with 'moderate' dustfall occurring during October. High evaporation rates, low precipitation rates and occurrence of high winds, combined with a comparatively high presence of erodible material are likely to contribute to ambient particulate matter concentrations.

5.13 Heritage and Archaeological Resources

Regional archaeological situation: Four relatively recent archaeological studies have been conducted around the greater farm portion for other proposed PV facilities as well as zinc prospecting. Most of these studies recorded Early Stone Age (ESA), Middle Stone Age (MSA) and Late Stone Age (LSA) artefacts scattered over the landscape.

According to the Heritage Impact Assessment (refer to Appendix I), which quotes the above information sources, the area surrounding Copperton is characterised by thousands of square kilometres of land covered by low-density lithic scatter. These artefacts are however generally very well weathered and mostly pertain to the ESA and MSA. Occasional LSA artefacts are also noted.

What is noteworthy of the Northern Cape archaeological record is the presence of pans which frequently display associated archaeological material. The archaeological importance of pans in the area are now well documented (Kiberd 2006, Wiltshire 2011, Orton 2012) and if any occur in the study area they could be of significance. Van der Walt (2012) recorded low densities of ESA, MSA and LSA scatters just west of the current study area and were given a field rating of low archaeological significance. However, several discrete MSA and LSA sites were also documented.

Archaeological description for the greater farm portion: Most of the material identified over the greater farm portion is MSA in nature consisting of large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes. Raw material are expected to be predominantly in fine grained quartzite, hornfels, banded ironstone, chert and vein quartz based on the results of the 2012 study by the author of this report.

Stone Age material is widespread across the greater farm portion. Small numbers of isolated ESA (dating to more than 200 thousand years ago) tools were documented across the farm consisting of bifaces (handaxes) made from quartzite. Six sites of heritage significance were recorded during the field study undertaken by the archaeologist and a further 36 find spots where artefacts were identified were mapped within each of the four PV sites.

Archaeological description for PV Center: two heritage sites requiring mitigation were identified:

» Site located around the pan, with a scatter of Middle Stone Age and to a lesser extent Later Stone Age artefacts scattered in varying densities around the pan. The pan is flagged as a no-go area.
» A knapping site where a quartz outcrop was extensively utilised (probably over a long time) resulting in dense concentration of MSA flakes and debitage gravitating downslope (approximately 20 meters). A few quartzite flakes were also noted mixed with the quartz debitage. Site density is approximately >5 per m² over an estimated area of 20 x 13 meters.

As indicated in Chapter 2, the layout plan for PV Center has responded to the identified heritage sites through *in-situ* preservation (to be conducted in line with a heritage management plan).

Figure 5.7: Quartz quarry located within PV Center where *in-situ* mitigation will occur

5.14 Palaeontology

The greater farm portion is underlain at depth by unfossiliferous Precambrian metasediments as well as by glacial sediments of the Dwyka Group that contain very few fossils (mainly reworked blocks of stromatolitic carbonate). The overlying superficial sediments (alluvium, gravels, eolian sands, soils etc) are of low to very low palaeontological sensitivity.

5.15 Noise Receptors in the Study Area

The undeveloped surroundings of the proposed development site mean that the background noise levels are very low 30 – 35 decibels (dBa). Noise sources in the immediate vicinity of the development site are restricted to low-density rough grazing of stock and associated and traffic on the R357. Traffic volumes are low, and therefore noise emanating from the road is relatively insignificant.

5.16 Visual Quality of the Study Area

The greater environment has a rural and undeveloped character. Settlements, where these occur, are limited in extent and domestic in scale. These vast, generally undeveloped landscapes are considered to have a high visual quality, except where developments, such as the Copperton Mine, represent existing visual disturbances.

A specific sense of place[8] related to the wide open, undeveloped space characterises the region, but is not particular to this study area.

[8] Sense of Place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by

5.17 Socio-Economic Environment

Major settlements: The main settlements in the Siyathemba Local Municipality (SLM) are the towns of Prieska, Marydale, Niekerkshoop, Draghoender and Copperton. The town of Prieska, which is the administrative seat of the SLM, is located on the southern bank of the Gariep, approximately 35 km north east of the proposed site. Prieska is by far the largest town in the SLM, and functions as the leader town in the SLM. The town promotes itself as "the gem of the Northern Cape", based on its setting at the foot of the Doringberg, within the Gariep valley, and surrounded by large scale irrigation agriculture operations along the Gariep (SLM IDP 2010/2011).

Status of infrastructure within the SLM: While relatively isolated (>100 km from the nearest medium-sized town), Prieska has good access to the main railway line to Namibia, good tarred road connections to Upington (249 km along the N10), Kimberley (238 km along the R386/ N8) and De Aar (~180 km along the N10), two landing strips for light aircraft, and a number of inexpensive industrial stands some with rail siding facilities (UOFS; 2007 and SLM IDP 2010/ 2011). The Prieska area is known for its high quality semiprecious stones, specifically tiger's eye. Marydale and Niekerkshoop are second tier towns. Both are small towns. Marydale benefits from its location along the N10 (Upington-De Aar), municipal service centres, schools and other public facilities (SLM IDP 2010/ 2011).

Economic activity: As in the Pixley ka Seme District Municipality (PKSDM), key activities in the SLM are related to primary sector activities, mainly agriculture and mining. Little local beneficiation takes place. Tourism and game farming (mainly for hunting) are significant emerging land uses.

Agricultural activity is by far the spatially most dominant land use in the SLM. While extensive stock farming accounts for ~98.7% of agricultural land use, it accounts for ~75% of the SLM' agricultural GDP. At least 12 major crop types are extensively cultivated in the Gariep valley (mainly east of Prieska), the most important of which are maize and wheat, peanuts, lucerne (alfalfa) and table grapes. Stock farming operations are mainly based on small stock (sheep, goats) on spatially extensive commercial farms. Both wool and carcasses are produced. Game farming (hunting) is emerging as a key diversification strategy (UOFS; 2007 and SLM IDP 2010/ 2011 Revision).

The mining sector historically played a major role in the local economy, with asbestos and copper/ silver (Copperton) mining the key activities. Currently,

a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role.

mining activities are mainly related to alluvial diamond mining activities along the Gariep River. The closure of asbestos mines (mainly to the north of Prieska) as well as the Copperton mine (~10 km west of the site) around the early 1990's has had a major lasting negative impact on the SLM economy. Former mining towns (like Copperton, which came into full operation in the early 1970's) have dwindled to virtual ghost towns. With regard to the former NCDMA 07, the bulk of whose population is concentrated in Copperton, an estimated 2166 people remained by 2007 (down from 3126 in 2007, a decrease of ~34%). The Copperton community is very isolated from employment opportunities, amenities, etc. The lack of water poses a significant constraint to development of the Copperton area.

The SLM tourism industry is in a fledgling stage, and largely based around the Gariep valley, and specifically the town of Prieska. A number of guest accommodation facilities are located in or near (<20 km) Prieksa – 13 according to the 2010/ 2010 SLM IDP. Tourism development (mainly focusing on Die Bos resort in Prieska, agro-tourism and game farming) is currently promoted as a key diversification strategy. Other established attractions in the SLM include its succulent/ xerophytic vegetation, interesting geology and semi-precious gemstones, sites of historical interest, and the "Karoo experience" – the sense of wilderness and desolation cherished by many South Africans and visitors alike. The R357 (Van Wyksvlei – Prieska, via Copperton and within 4.3km from the proposed PV Center site) has been proposed as a scenic drive with touristic potential in the 2006 Pixley ka Seme Spatial Development Framework.

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE BOSJESMANSBERG PV CENTER SOLAR ENERGY FACILITY CHAPTER 6

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the proposed **Bosjesmansberg PV Center Solar Energy Facility**. This assessment is done for all of the facility's components which will comprise:

» Arrays of PV panels and respective inverter stations
» Appropriate mounting structures
» Cabling between the project components, to be lain underground where practical
» An on-site substation including a building for control and storage
» An overhead power line to facilitate the connection between the on-site substation and the Eskom grid via a loop in/loop out configuration to the Cuprum-Burchell 132kV power line which traverses the greater farm portion
» Permanent laydown areas
» Laydown areas for the construction phase
» Internal access roads
» Fencing.

The development of PV Center will comprise of the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of the access road, electricity generation infrastructure, construction camp, temporary and permanent laydown areas, transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan. Construction of PV Center is expected to take approximately 9-12 months.
» *Operation* – will include operation of the facility and the generation of electricity. The operational phase is expected to extend in excess of 20 years.
» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately within this chapter.

6.1. Methodology for the Assessment of Impacts

A broader site of 338 hectares was identified by the project developer for the purpose of establishing the proposed PV Center facility. However, the development footprint for 75MW will cover an extent of approximately 220 hectares. A preliminary facility layout was developed by taking cognisance of the environmental sensitivities and technical preferences identified during the scoping phase and refined based on surveys conducted during the EIA phase. This 220 hectares is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The assessment of potential issues has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The Comments and Response Report included within Appendix E lists these issues and the responses given by the EAP during the Scoping Phase.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas. This includes the area required for the photovoltaic panels and associated infrastructure and switching station, and equates to ~4.1% of the entire farm portion (i.e. (220ha/5350ha)x100).

6.2. Assessment of the Potential Impacts associated with the Construction and Operation Phases

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed solar energy facility on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.2.5). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation/enhancement and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

6.2.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure; this 75MW PV facility requires 220 hectares. The expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix E - Ecology Report for more details):

The vegetation of the site consists of shrubland on calcrete plains, which correspond to the Northern Upper Karoo vegetation type. All the vegetation types at the site are however classified as Least Threatened. The site does not fall within any "protected areas" or "Critical biodiversity areas". No protected trees occur on the site.

The ecological sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance. This sensitivity assessment is based on a desktop study, detailed field evaluation of the site and detailed analysis of aerial photography. From this assessment, it has been concluded that the majority of the site (approximately 57%) is of low sensitivity associated with Calcrete Shrublands however there are a number of features that have to be taken into account in order to evaluate sensitivity in the study area. These include the following:

» **Pans** representing approximately 1% of the site: There is a pan situated within the northern section of the site. Due to the ecological significance of the pan, it is considered highly sensitive and no development should take place within 100m from the pan. A water use license (WUL) is required to be obtained if infrastructure lies within 500m of wetland features.
» **Drainage lines and washes** representing approximately 3% of the site: Due to the poorly developed nature of drainage lines at the site, two categories of drainage are recognised being well-developed drainage lines which are defined by a recognisable channel and usually with associated woody vegetation and washes which are broad areas which receive runoff during large runoff events, but do not have a defined channel and are considered less sensitive than actual drainage lines. Drainage lines and washes have been mapped in the southern extent of the site. Impacts on drainage lines may require General Authorisation or permiting from the National Department of Water Affairs.
» **Arid grassland or grassy shrubland** representing approximately 39% of the site: Due to the general proximity of this habitat type to the rocky hills the higher abundance of species of conservation concern it is considered of moderate sensitivity, lying between the lower sensitivity calcrete plains and the higher sensitivity rocky hills located off of the site.

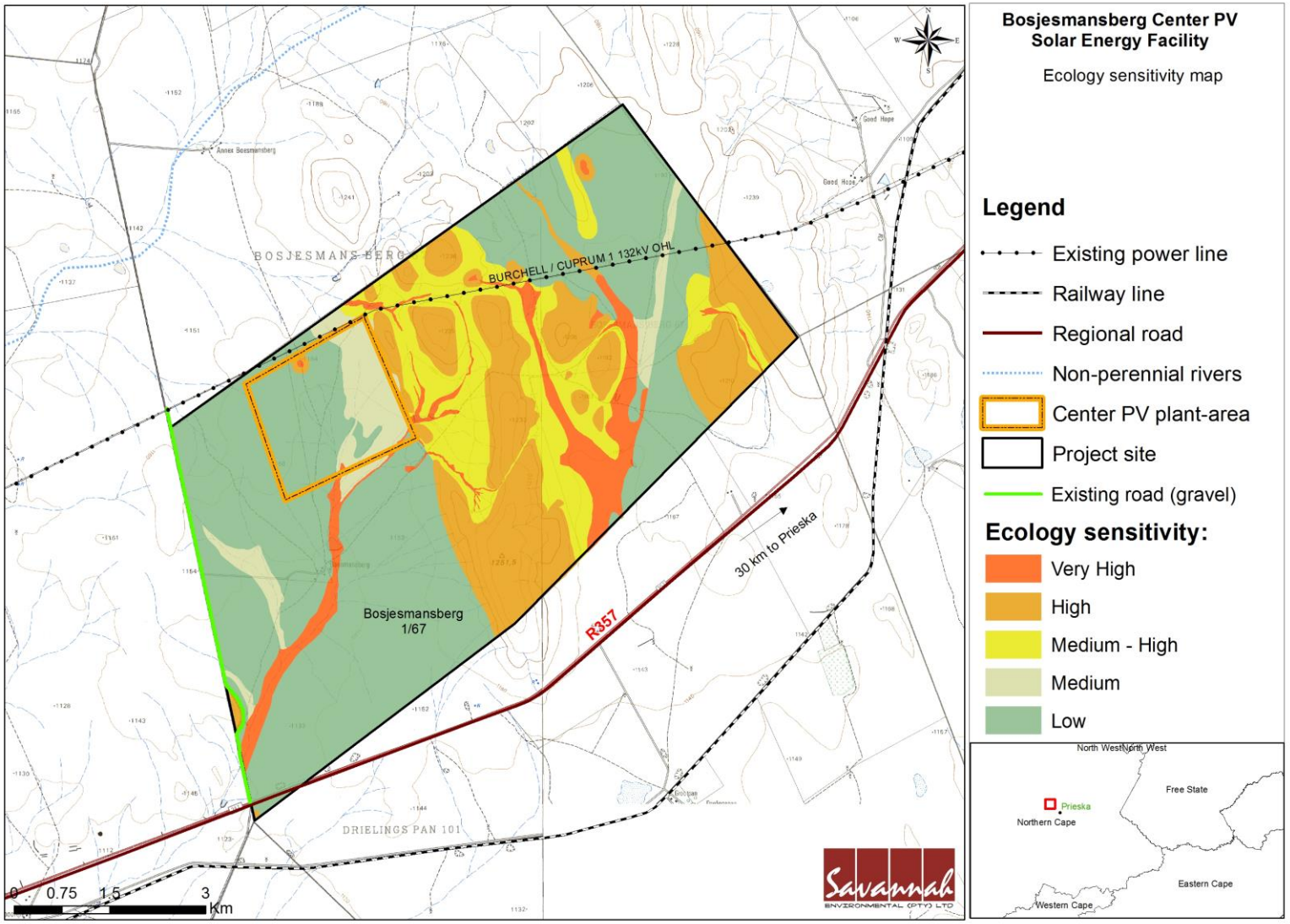

Figure 6.1: Ecology sensitivity map for PV Center with the facility site boundary indicated by the orange and black boundary

a) Impacts on vegetation and listed plant species

Preconstruction phase: Preconstruction activities such as geotechnical investigations, access road construction or other unauthorised vegetation clearing may have a negative impact on vegetation and the various listed species present. The implementation of standard environmental good practice during this phase would reduce the likely significance of the impact generated by preconstruction activities, but given the high abundance of some protected species such as *Harpagophytum procumbens*, an impact on such species cannot be excluded and is assessed for this phase of the development.

Impact Nature: Impacts on vegetation and listed plant species may occur as a result of preconstruction activities.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Medium (4)	Low (2)
Probability	Probable (4)	Improbable (2)
Significance	Low (24)	Low (8)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes.	
Mitigation	• No unauthorised site clearing or disturbance at the site prior to a walk-through of the development footprint by a suitably qualified ecologist. • The final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction. • Areas where exploration work is permissible should be clearly demarcated.	
Cumulative Impacts	Cumulative impacts at the preconstruction phase would be low.	
Residual Impacts	With avoidance measures there should be little residual impact on flora.	

Construction phase: Listed and protected plant species are fairly common and widespread at the site and some level of impact on these species in unavoidable. This impact is therefore assessed as a likely outcome of the development.

Within the sandy areas, such as along the eastern edge of PV Center, the geophytic herb *Harpagophytum procumbens* was common. This species is

protected at the national and provincial level on account of its' popularity as a medicinal plant. It is however not rare and the population is estimated at several million plants. Affected individuals can be translocated as their survival probability is high.

Impact Nature: Impacts on vegetation and listed plant species will occur due to vegetation clearing and disturbance associated with the construction of the facility.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium-High (7)	Medium (5)
Probability	Highly Probable (4)	Probable (3)
Significance	Medium (52)	Low (27)
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes, through avoidance of sensitive areas	
Mitigation	• Preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DAFF permitting requirements. • Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • Eco to provide supervision and oversight of vegetation clearing activities within sensitive areas. • Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. Within the PV areas, the ground layer should be left intact if possible to minimise biodiversity loss as well as protect the soil from erosion. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed. • Temporary lay-down areas should be located within the development footprint or within areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	

Cumulative Impacts	The potential for cumulative impacts is moderate as there are several other similar facilities in the area which include the 4 proposed on the Bosjesmansberg farm. There are however no narrow endemics in the area that would be significantly impacted by the development.
Residual Impacts	As the abundance of listed and protected species is fairly high, it is unlikely that all of these can be avoided or translocated and some impact on listed and protected species is an inevitable and unavoidable consequence of the development.

b) Faunal impacts

Pre-construction: Uncontrolled access to the site and preconstruction activities may be detrimental to fauna. Poaching of susceptible species may occur as a result of increased access to the site and site clearing or disturbance with heavy machinery may also result in mortality of fauna unable to avoid the disturbance. Although the significance of this impact is not likely to be very high, it is a possible outcome of preconstruction activities.

Impact Nature: Disturbance or persecution of fauna during the preconstruction phase may occur.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Medium (4)	Low (2)
Probability	Probable (3)	Improbable (2)
Significance	Low (18)	Low (8)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes.	
Mitigation	• Site access to be controlled and no unauthorized persons should be allowed onto the site. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • No fires to be allowed on site. • No fuelwood collection should be allowed on-site. • No dogs should be allowed on site. • No hazardous materials should be stored on site. Any accidental chemical, fuel and oil spills that occur at the site during preconstruction should be cleaned up in the appropriate manner as related to the nature of the spill. • No open excavations, holes or pits should be left at the site as smaller fauna and invertebrates may fall	

	in and become trapped.
Cumulative Impacts	Cumulative impacts on fauna at the preconstruction phase are low.
Residual Impacts	With avoidance measures there should be no residual impact on fauna.

Construction phase: Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals or reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. This impact is assessed as a possible construction-phase impact associated with the development.

Disturbance during construction is likely to fairly high and many of these species are likely to avoid or move away from the construction areas. Species such as Ground Squirrel and Yellow Mongoose which were observed with burrows within the development areas would be most affected and where possible active burrows within the development footprint should be left intact as burrows within the calcrete plains are easily excavated and are often a limiting factor for such species.

Impact Nature: Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (3)	Short-term (3)
Magnitude	Medium (6)	Low (5)
Probability	Highly Probable (4)	Probable (3)
Significance	Medium (44)	Low (27)
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Large amounts of noise and disturbance at the site during construction is largely unavoidable.	
Mitigation	• Site access should be controlled and no unauthorized persons should be allowed onto the site. • Any fauna directly threatened by the	

	construction activities should be removed to a safe location by the ECO or other suitably qualified person. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site. • Fires should not be allowed on site. • No fuelwood collection should be allowed on-site. • No dogs should be allowed on site. • If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
Cumulative Impacts	During the construction phase the activity would contribute to cumulative fauna disturbance and disruption in the area, but the impact would be of local extent and not of high significance.
Residual Impacts	There will be some residual impact as the facility will persist past the construction phase.

Operational phase: During the operational phase of the development, interactions between fauna and the infrastructure of the facility may generate negative impacts on fauna. Possible impacts include electrocution of species such as tortoises along electric fences, and the persecution or poaching of fauna within the facility. As there is a possibility that this impact would occur, it is assessed for the development.

During the operational phase the levels of disturbance associated with the development will be significantly lower and disturbed species or individuals are likely to return to the site. The major potential impact at this stage would be the disruption of landscape connectivity resulting from the presence of the facility and especially fencing around the site which might prevent the movement of fauna. Although little can be done to mitigate the presence of the facility itself, there are a variety of measures that can be taken to reduce the impact of the development on landscape connectivity. This includes retaining a ground layer of vegetation within the development areas as well as using fencing which allows smaller fauna

access to these areas. Larger fauna such as antelope are mobile enough to be able to pass around the development areas.

Impact Nature: The operation and presence of the facility may lead to disturbance or persecution of fauna.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium-Low (4)	Low (3)
Probability	Probable (3)	Improbable (2)
Significance	Medium (33)	Low (16)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes.	
Mitigation	• No unauthorized persons should be allowed onto the site. • Undesirable and problem fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • No fires should only be allowed at the site. • No fuelwood collection should be allowed on-site. • No dogs should be allowed on site. • If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	
Cumulative Impacts	The development would contribute towards habitat loss for fauna in the area, but as the landscape is currently overwhelmingly intact this would be a small contribution that is not considered highly significant.	
Residual Impacts	The site has been transformed in the past and the facility may offer better faunal habitat than currently the situation under regular cropping, so residual impacts are not likely.	

c) Soil erosion and associated degradation of ecosystems

Pre-construction phase: Due to the relatively flat nature of the site and low footprint of preconstruction activities it is highly unlikely that erosion would be a significant risk during the preconstruction phase. Therefore, this impact is not assessed for the preconstruction phase.

Construction phase: The construction phase of the development would generate a large amount of disturbance which would leave the disturbed areas vulnerable to erosion. Although most of the site is fairly flat, some of the development areas include gentle slopes where the risk of erosion problems would be high. The construction phase is however transient and the majority of this impact would manifest during the operational phase rather than during construction, but it is assessed for both phases.

Impact Nature: Increased erosion risk as a result of soil disturbance and loss of vegetation cover as well as increased runoff generated by hardened surfaces such as roads.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (1)
Magnitude	Medium (5)	Low (3)
Probability	Probable (3)	Improbable (2)
Significance	Low (24)	Low (10)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated?	Yes	
Mitigation	• All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion during construction to ensure that no erosion problems have developed as result of the disturbance. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • A ground cover of vegetation should be left intact wherever possible to bind the soil and limit erosion. • Cleared and disturbed areas should be rehabilitated on a progressive basis as construction progresses.	
Cumulative Impacts	Cumulative impacts are likely to low after mitigation	

Residual Impacts	If erosion at the site is controlled, then there will be no residual impact

Operational phase: The large amount of disturbance created during construction will leave the site vulnerable to soil erosion. Although the site is relatively flat, the service roads and panels will generate a lot of runoff during intense rainfall events that will need to be properly managed in order to prevent erosion. This is a potential impact associated with the development and is assessed.

Impact Nature: Increased erosion risk as a result of soil disturbance and loss of vegetation cover as well as increased runoff generated by the panels, service and access roads.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium (5)	Low (2)
Probability	Highly Probable (4)	Improbable (2)
Significance	Medium (44)	Low (12)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated?	Yes	
Mitigation	• All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • A cover of indigenous grasses should be established in order to bind the soil and prevent erosion.	
Cumulative Impacts	Cumulative impacts are likely to very low after mitigation	
Residual Impacts	If erosion at the site is controlled, then there will be no residual impact	

d) Impact on drainage lines and other water resources

While drainage lines occur within the PV Center project site, no drainage lines will be directly impacted by the proposed PV Center facility footprint. The fence line of the PV array is situated within 50m from a drainage line delineated on the project site. Placing PV panels and other temporary or permanent infrastructure within the drainage lines that occur on the site is not recommended.

Nature: Loss of drainage lines: Construction will lead to some indirect loss of or damage to dry river beds and non-perennial drainage lines or some changes to the catchment of these areas. No drainage lines will be directly		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium (5)	Low (2)
Probability	Probable (4)	Improbable (3)
Significance	Medium (40)	Low (18)
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Avoid or minimise direct impacts on a watercourse and associated riparian areas. » If necessary, cross watercourses perpendicularly, where possible, to minimise the construction footprint. » Adequate culvert and/or bridge structures are required at the access road crossings. » Construction must not cause the width of the watercourse to be narrowed. » There may be a legal obligation to apply for a Water Use Licence for any wetlands/ drainage lines (and associated riparian vegetation) that may be affected, since they are classified in the National Water Act as a water resource.		
Cumulative: *Downstream impacts and erosion of watercourses*		
Residual: *None*		

e) Alien Plant Invasion

Operational phase: Although alien plant abundance at the site is relatively low, a number of alien species were observed within disturbed areas and within the open veld and the disturbance generated at the site during the construction phase would be sure to encourage the invasion of the disturbed areas by alien species. Active control measures are likely to be required to combat this problem during the first few years of the operational phase. This is a likely outcome of the development and is assessed.

Impact Nature: Alien plants are likely to invade the site as a result of the large amounts of disturbance created during construction

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium (5)	Low (2)
Probability	Probable (4)	Improbable (3)
Significance	Medium (40)	Low (18)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation	• Due to the disturbance at the site as well as the increased runoff generated at the site, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. • Rehabilitation of cleared areas with indigenous grass species after construction to reduce alien invasion potential. • Regular monitoring for alien plants within the development footprint. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	
Cumulative Impacts	Alien invasion would contribute to cumulative habitat degradation in the area, but if alien species are controlled then, then cumulative impact from alien species would not be significant.	
Residual Impacts	If alien species at the site are controlled, then there will be very little residual impact	

Implications for Project Implementation

» All activities to avoid drainage lines and fringing riparian vegetation
» All activities to avoid pans and 100m around the outer boundary of the pan to preserve ecological functioning
» Apply for permits where listed species are identified through a pre-construction walkthrough
» Apply for a Water Use License / General Authorisation where development within 500m from the pan is contemplated.

6.2.2 Potential Impacts on Avifauna

Avifaunal impacts of the larger farm portion, which could extend to PV Center are likely to manifest in the following ways:

» Disturbance and displacement of resident/migrant raptor species (notably Secretarybird, Martial Eagle, Black-chested Snake-eagle, Lanner Falcon and Southern pale Chanting Goshawk) from foraging/breeding areas by construction and/or operation of the facility, and/or mortality of these species in collisions with new power lines, or electrocution when perched on power lines.
» Disturbance and displacement of large terrestrial birds (notably Ludwig's Bustard, Northern Black Korhaan, Karoo Korhaan and possibly Kori Bustard and Blue Crane) from nesting or foraging areas by construction and/or operation of the facility and/or mortality of these species in collisions with new power lines.
» Disturbance and displacement of resident or breeding Namib-Karoo species (notably Ludwig's Bustard, Karoo Korhaan, Scalter's Lark, Stark's Lark, Sociable Weaver, Sickle-winged Chat, White-browed Sparrow Weaver and Black-headed Canary) from foraging/breeding areas by construction and/or operation of the facility;
» Disturbance and displacement of resident and breeding waterbirds (notably Spur-winged Goose, Egyptian Goose, South African Shelduck and Black-winged Stilt) from nesting and/or foraging areas by construction and/or operation of the facility, and/or mortality of these species in collisions with power line infrastructure while commuting between resource areas.

a. <u>Habitat Loss</u>

Construction: Construction activities would result in a negative direct impact on the avifauna of PV Center due to loss of avifaunal habitats

	Without mitigation	**With mitigation**
Extent: The extent of this impact is **local** as it is limited to the site	Moderate (3)	Low (2)
Duration	Very short (1)	Very short (1)
Magnitude	Moderate (4)	Moderate (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**32 (Medium)**	**28 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be	Yes	

mitigated?		
Mitigation • Restricting the construction footprint, including access roads to a minimum		
Cumulative impacts Although the magnitude of the impact is moderate-low, and taking into account the possibility of the construction of the proposed Garob WEF facility which lies immediately to the east (Smallie 2012) and associated power line infrastructure between these two sites there is likely to be the loss of additional habitat from the area in general. This would therefore have further impacts on the occurrence of avifauna in the area.		
Residual impacts For those habitats that will be lost/impacted the associated avifauna will need to find alternative habitats which will most likely be in areas adjacent to the site.		

b. Disturbance

Construction: construction activities would result in a **negative direct impact** on the avifauna at PV Center resulting in disturbance to bird communities.

	Without mitigation	**With mitigation**
Extent: The extent of this impact is **local** as it is limited to the site	High (4)	Moderate (3)
Duration	Very short (1)	Very short (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**44 (Medium)**	**32 (Medium)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation • Reducing and maintaining noise disturbance to a minimum particularly with regards to any drilling for foundations. Drilling activities should, wherever possible, be limited to periods outside of the breeding seasons of the resident avifaunal community and in particular for priority species. • Excluding development or disturbance from sensitive areas.		
Cumulative impacts The only likely cumulative impact would be the further disturbance (and probably further		

displacement) to birds that may have vacated the areas in the adjacent renewable energy facility projects now utilising the habitats in the Bosjesmansberg SEF site.
Residual impacts No residual impacts are envisaged.

Operation: operational activities would result in a **negative direct** impact on the avifauna on the PV Center site through displacing birds caused by disturbance.

	Without mitigation	**With mitigation**
Extent: The extent of this impact is **local** as it is limited to the site	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	**21 (Low)**	**15 (Low)**
Status	Negative	Neutral
Reversibility	Low	Low
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation • Minimizing the disturbance associated with the operation of the facility (e.g. vehicular traffic), by scheduling maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times (e.g. breeding season) • Following the construction phase the extent of access roads within the facility should be kept to a minimum.		
Cumulative impacts No major cumulative impacts are envisaged.		
Residual impacts No residual impacts are envisaged.		

6.2.3 Potential Impacts on Soils and Agricultural Potential

The major limitations to agriculture are the aridity and the shallow soils limited in depth by rock and calcrete. Because of the aridity and soil constraints the only possible agricultural land use is small stock grazing. Water for stock watering points is obtained from boreholes on the farm. There is no water available for irrigation, and no irrigated land on the farm.

During construction of the PV facility, potential impacts on and related to soils include:

» Loss of agricultural land;
» Soil erosion and degradation;
» Soil contamination;
» Generation of alternative land use income.

a) Loss of agricultural land use

The farm is located within a sheep farming agricultural region. There has never been any cultivation or irrigation on the site as the majority of the site is categorised as non-arable, low potential grazing land. The components of the project that can impact on agricultural resources and productivity are occupation of the site by the footprint of the facility, and construction activities that disturb the soil profile and vegetation (clearing, levelling, excavations, etc). Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be low, especially since the development will be of limited size. The proposed PV Center development footprint represents 4.1% of the total farm portion.

Construction, operation and decommissioning: This impact is caused by direct occupation of land by footprint of energy facility infrastructure and having the effect of taking affected portions of land out of agricultural production.

	Without mitigation	**With mitigation**
Extent	Low (1) – Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Small (1)	Small (1)
Probability	Definite (5)	Definite (5)
Significance	30 (Medium)	30 (Medium)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Cumulative impacts: The overall loss of agricultural land in the region due to other developments. The significance is low due to the limited agricultural potential of the area, and the small extent of this proposed development.		
Residual impacts: No mitigation possible so same as impacts without mitigation		

b) Generation of alternative land use income

Construction, operation and decommissioning: This impact is caused by the alternative land use of energy facility rental on low productivity agricultural land in combination with continued farming on the rest of the farm and having the effect of providing land owners with increased cash flow and improved rural livelihood.

	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Minor (3)
Probability	Highly probable (4)	Highly probable (4)
Significance	32 (Medium)	32 (Medium)
Status	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Cumulative impacts: None		
Residual impacts: None		

c) Soil erosion

Construction, operation and decommissioning: The area occupied by the PV Panels will not be cleared of vegetation and the PV panels will be fixed onto the soil, therefore soil loss and major excavations are not anticipated. The construction of access roads and erection of the PV panels could cause soil erosion or soil contamination (when fuels and oils are used and spillages may occur). Dust may be generated from bare areas for the construction of access roads. Soil erosion may be accelerated by agents such as the wind, soil or water.

The use of fuel, oils and chemical substances may cause soil contamination, without mitigation or preventative measures. Soil contamination can be avoided by the use of mitigation measures and good soil management methods including:

» Storm water must be controlled through adequate mitigation and control structures.
» Impacts from vehicles, such as spillages of oil and hydrocarbons, should be prevented and mitigated.

» Dust generation on site should be mitigated and minimised as the dust can negatively affect the quality of pastures as well as sheep production. Due to the nature of the soils on the site this is considered an aspect of high priority.

This impact is caused by the alteration of run-off characteristics due to hard surfaces and access roads and having the effect of loss and deterioration of soil resources. There is however a low risk of erosion due to the very gentle slopes and high permeability soils.

	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (3)
Probability	Probable (3)	Very improbable (1)
Significance	27 (Low)	8 (Low)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Implement an effective system of run-off control where it is required that collects and disseminates run-off water from hardened surfaces and prevents potential down slope erosion. This should be in place and maintained during all phases of the development.		
Cumulative impacts: None		
Residual impacts: Low		

d) Loss of topsoil

Construction phase: This impact is caused by poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and having the effect of loss of soil fertility on disturbed areas after rehabilitation.

	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Very improbable (1)

Significance	24 (Low)	7 (Low)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: 1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface spoils from excavations where they will not impact on agricultural land, or where they can be effectively covered with topsoil.		
Cumulative impacts: None		
Residual impacts: None		

e) Degradation of veld vegetation surrounding construction activities

Construction and decommissioning: This impact is caused by trampling due to vehicle passage in non-approved areas of the site.

	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Short (2)	Short (2)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Improbable (2)
Significance	15 (Low)	8 (Low)
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: 1. Minimize road footprint beyond construction site and control vehicle access on roads only.		
Cumulative impacts: None		
Residual impacts: Low		

f) Soil contamination due to pollution of soil by contaminants

Construction and decommissioning: This impact is caused by accidental spillages of hazardous substances and other pollutants (e.g. fuel, oil, chemicals,

cement) onto soil resulting in contamination of the soil due to poor management practices during the construction and decommissioning phases. No permanent storage facilities for the storage of hazardous goods are required on the site.

	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Very short term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (18)**	**Low (12)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Yes	Minor
Can impacts be mitigated?	Yes	
Mitigation: » All temporary hazardous goods storage facilities must be situated in an access controlled site within a bunded area which can accommodate 110% of the volume of the total storage capacity of the container. » Control use and disposal of potential contaminants or hazardous materials. » Remove contaminants and contaminated topsoil and replace topsoil in affected areas.		
Cumulative impacts: » The cumulative impact of soil contamination is considered low due to the undeveloped nature of the study area. Further development of the site will not significantly increase the impact.		
Residual impacts: » Minor negative – slow regeneration of soil processes in and under topsoil		

Implications for Project Implementation

» The proposed site for PV Center is situated on soils of low agricultural potential and of low soil erosion risk.
» The disruption to grazing practices conducted by the landowner due to construction and occupation by the PV panels will be minimal due to the limited size of the site relative to the total land under grazing.
» The only significant potential negative impacts on soils are soil degradation as a result of construction activities. However, with effective implementation of mitigating measures, these impacts are considered to have a low significance, requiring good soil management measures during construction and operational of the plant, however it does not pose a threat to the status-quo or the feasibility of the development.

6.2.4 Assessment of Potential Heritage Impacts

Potential impacts on heritage sites relate to the direct loss of these features during construction. Two heritage sites were identified on the site:

» The first site consists of a knapping site where a quartz outcrop was extensively utilised (probably over a long time) resulting in dense concentration of MSA flakes and debitage gravitating downslope (approximately 20 meters) was identified. A few quartzite flakes were also noted mixed with the quartz debitage. Site density is approximately >5 per m² over an estimated area of 20 x 13 meters.
» The second site is located around the pan situated in PV Center with a scatter of Middle Stone Age and to a lesser extent Later Stone Age artefacts scattered in varying densities around the pan.

a) <u>Loss of heritage resources</u>

Construction: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects which have been identified.

	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Most Likely (4)	Probable (2)
Significance	**44 (Medium)**	**18 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation: **Avoidance:** It is recommended that the sites should be mitigated through preservation or if this is not possible, excavated and recorded. If preserved, the sites must be demarcated with danger tape during the construction phase of the project to protect the site from accidental damage		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive resulting in regional loss of archaeological material.		
Residual Impacts: Depletion of archaeological record of the area.		

Implications for Project Implementation

» **Site preservation:** Two sites of heritage significance were identified during the heritage survey and *in-situ* preservation of the sites is recommended.
» In the north eastern portion of PV Center archaeological visibility was at its lowest due to moderate to deep red Aeolian sands and low bushes. The Aeolian sands that covered most of the recorded sites also hampered an accurate estimation of site density and site extent. Depending on erosion and movement of the sand these counts can vary to a large degree when the site is revisited in future. Therefore, should archaeological sites be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner such that an investigation and evaluation of the find can be made.

The impact significance of the solar facility development on local fossil heritage resources is considered to be very low (as confirmed by the project Palaeontologist) and no assessment of this impact has been undertaken.

6.2.5 Assessment of Potential Visual Impacts

Visual Impact of the PV Facility – Operational Phase

The study area for the visual impact assessment encompasses a geographical area of 744km^2 and includes a minimum 12km buffer zone from the proposed development area. It includes the small town of Copperton and its outlying copper mining activities, a section of the R357 arterial road and a number of major secondary roads.

The visibility analysis was undertaken from a number of vantage points within the proposed development area at an offset of 4m above average ground level and a maximum of 10m (i.e. the approximate height of the proposed PV infrastructure). This was done in order to determine the general visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures (PV panels) associated with the facility. The viewshed indicates areas from which the proposed PV infrastructure would be visible. It must be noted that the viewshed analyses do not include the effect of vegetation cover or existing structures on the exposure of the proposed facility, therefore signifying a worst-case scenario.

Theoretical visibility within a 2,5km radius of the facility includes mainly the proposed development site itself, vacant land and a section of the R357 arterial road. The PV structures are expected to be highly visible from this road from relatively short distances.

Visibility between the 2,5 and 5km radii includes predominantly vacant natural or grazing land as well as limited farm residences, specifically Annex Boesmansberg to the north.

The extent of visibility is considerably reduced beyond the 5km radius, especially to the north east, east and south west, but extends to the north to the 10km radius, and further south beyond the 10km radius. No exposed residences or homesteads lie within the 5-10km zone.

Visibility beyond 10km from the proposed development is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer. The zone includes the town of Copperton, the copper mine and the Cuprum and Kronos Substations.

The result of the viewshed analysis for the proposed facility is shown in Figure 6.2.

Visual impact index

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed facility are shown in Figure 6.4. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index.

Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index. An area with short distance, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The visual impact index for the proposed facility is further described as follows.

- The visual impact index map indicates a core zone of moderate visual impact within 2,5 km of the proposed facility.
- Sensitive visual receptors within this zone are limited to existing settlements to the south of the facility (within the site). These receptors are likely to experience high visual impact.
- The extent of visual impact remains high between 2,5km and 5km of the proposed facility. Some visually screened areas occur to the west, east and north, and to a lesser extent to the south. Visual impacts within this zone are mostly low. Sensitive visual receptors include users of the R357 in the south and residents of homesteads and settlements, specifically Annex Boesmansberg. These receptors are likely to experience moderate visual impact.
- Between 5km and 10km of the proposed facility, the extent of potential visual impact is significantly reduced. Visually exposed areas occur mainly in the north west and in the south. Areas in the north east, east and south west are screened from potential visual impact. Where they occur, visual impacts within this zone are likely to be very low. Sensitive visual receptors at this distance are limited to a homestead to the north west of

the facility. Visual impacts on these sensitive receptors are likely to be low.

» Remaining impacts beyond 10km of the proposed facility are expected to be very low or negligible, where these occur at all.

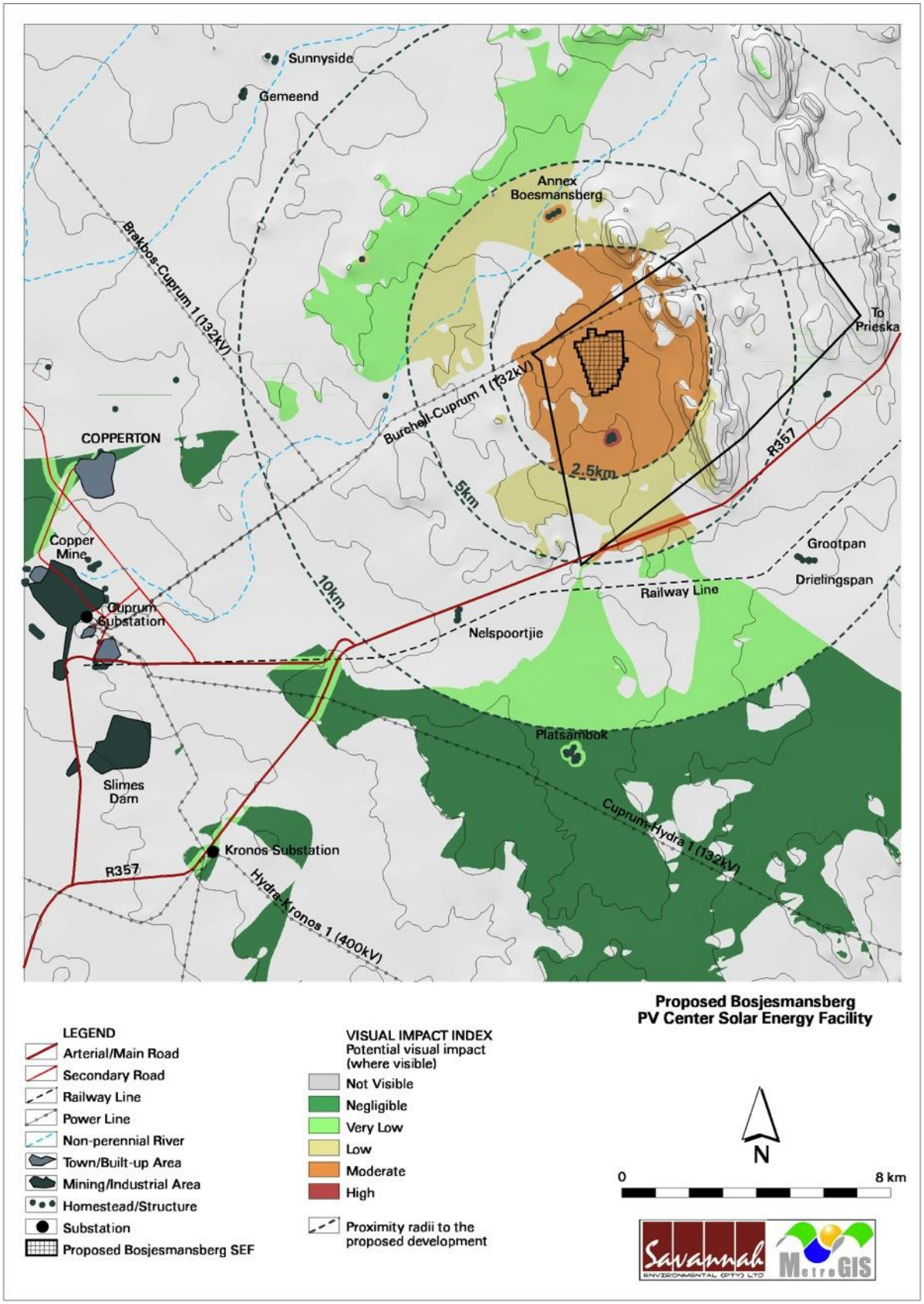

Figure 6.2: Map illustrating Visual Impact Index for the PV Center Facility on Portion 1 of the Farm Bosjesmansberg 67

a) Potential visual impact on sensitive visual receptors in close proximity to the proposed facility.

Sensitive visual receptors in close proximity to the proposed Solar Energy Facility include users of the R357 and residents of settlements and homesteads. Visual impacts of the SEF on the R357 arterial road are limited to a short section to the south of the facility and visual impacts on residents of homesteads are limited to a single occurrence, within the boundary of the site.

The relatively low incidence of roads, the anticipated low usage thereof, and the low population density within this environment reduces the probability of this impact occurring. The proximity of the proposed facility to the existing Copperton Mine and power line infrastructure (i.e. an existing visual disturbance) also contributes to this probability rating.

Visual impacts are expected to be of moderate significance and, in summary include the following.

- » Visual impact on users of the R357 and on residents of homesteads and settlements in close proximity to the proposed facility
- » Visual impact on users of the R357 and on residents of homesteads and settlements within the region
- » Visual impact of the substation, internal access roads, workshop and offices located on the site on sensitive visual receptors in close proximity to the proposed facility
- » Visual impact of direct lighting and sky glow on sensitive visual receptors in close proximity to the proposed facility.
- » Visual impact of construction activities, vehicles and dust on sensitive visual receptors in close proximity to the proposed facility.
- » Visual impact of the proposed facility on the visual quality of the landscape and sense of place of the region
- » Cumulative visual impact of the proposed facility on the visual quality of the landscape and sense of place of the region

a) Visual impact on users of the R357 and on residents of homesteads and settlements in close proximity to the proposed facility

	No mitigation	***Mitigation considered***
Extent	Local **(2)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	High **(8)**	N/a

Probability	High **(4)**	N/a
Significance	Moderate **(56)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	Yes	
Mitigation / Management: Planning: ➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. Operations: ➢ Maintain the general appearance of the facility as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.		
Cumulative impacts: The construction of the PV panels together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure and mining already present in the area as well as other alternative energy facilities proposed within the region.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

b) Visual impact on users of the R357 and on residents of homesteads and settlements within the region

	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Moderate **(6)**	N/a
Probability	Improbable **(2)**	N/a
Significance	Low **(26)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

- Maintain the general appearance of the facility as a whole.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of the PV panels together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure and mining already present in the area as well as other alternative energy facilities proposed within the region.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

c) Visual impact of the substation, internal access roads, workshop and offices located on the site on sensitive visual receptors in close proximity to the proposed facility

	No mitigation	***Mitigation considered***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(24)**	Low **(10)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

- Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.
- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Construction:

- Rehabilitation of all construction areas.
- Ensure that vegetation is not cleared unnecessarily to make way for access roads and ancillary buildings.

Operation:

➢ Maintenance of roads to avoid erosion and suppress dust. Decommissioning: ➢ Removal of infrastructure and roads not required for post decommissioning use and rehabilitation of the footprint areas. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the substation, internal access roads, workshop and offices will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure and mining already present in the area as well as other alternative energy facilities proposed within the region.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

d) Visual impact of direct lighting and sky glow on sensitive visual receptors in close proximity to the proposed facility.

	No mitigation	***Mitigation considered***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(24)**	Low **(12)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

- Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
- Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.
- Make use of minimum lumen or wattage in fixtures.
- Make use of down-lighters, or shielded fixtures.
- Make use of Low Pressure Sodium lighting or other types of low impact lighting.
- Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Cumulative impacts:

The town of Copperton and the Copperton Mine already generates light at night. The impact of the proposed SEF will contribute to a regional increase in lighting impact. This is also relevant considering the other alternative energy facilities proposed within the region.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

e) Visual impact of construction activities, vehicles and dust on sensitive visual receptors in close proximity to the proposed facility.

	No mitigation	***Mitigation considered***
Extent	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(30)**	Low **(16)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

- Retain and maintain natural vegetation in all areas outside of the development footprint.

Construction:

- Ensure that vegetation is not unnecessarily removed during the construction period.
- Reduce the construction period through careful logistical planning and productive implementation of resources.
- Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
- Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
- Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
- Rehabilitate all disturbed areas immediately after the completion of construction works.

Cumulative impacts:

None.

Residual impacts:

None, provided rehabilitation works are carried out as specified.

f) Visual impact of the proposed facility on the visual quality of the landscape and sense of place of the region

	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a

Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Improbable **(2)**	N/a
Significance	Low **(22)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

- Maintain the general appearance of the facility as a whole.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

g) Cumulative visual impact of the proposed facility on the visual quality of the landscape and sense of place of the region

	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Moderate **(6)**	N/a
Probability	H Probable **(4)**	N/a
Significance	Moderate **(52)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

- Maintain the general appearance of the facility as a whole.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

6.2.6 Assessment of Potential Social Impacts

a. <u>Creation of employment and business opportunities – construction phase</u>

Impacts associated with the construction phase of a project are usually of a short duration, temporary in nature, but could have long term effects on the surrounding environment. The operational life of a PV facility is between 20 - 25 years, after which the facility would possibly be upgraded to continue its lifespan if feasible, or decommissioned. The impacts usually associated with the operational phase are therefore perceived by affected parties to be more severe.

The construction phase for PV Center is expected to extend over a period of 18-24 months and create approximately 500 employment opportunities, depending on the final design. Of this total ~ 60% (300) will be available to low-skilled workers (construction labourers, security staff etc.), 10% (50) to semi-skilled workers (drivers, equipment operators etc.) and 30% (150) to skilled personnel (engineers, land surveyors, project managers etc.). The total wage bill for the construction phase is estimated to be in the region of R 13 million (2013 rand values). This is based on the assumption that the average monthly salary for low skilled, semi-skilled and skilled workers will be in the region of R 7 000, R 10 000 and R 35 000 respectively for the relevant construction period allocation. The injection of income into the area in the form of wages will represent a significant opportunity for the local economy and businesses in the Prieska area.

The construction period for all four 75 MW projects of the Bosjesmansberg Solar Energy Facility is expected to extend over a period of ~ 8 years, considering no simultaneous construction of different phases. It is assumed that the majority of workers employed to construct the first 75 MW project will be employed for the remaining three 75 MW projects. The development of each project will therefore not create an additional 500 employment opportunities. However, each of the remaining three 75 MW projects will generate an additional R 13 million in wages. The total wage bill will therefore be in the vicinity of R 52 million (2013 Rand values).

The majority of low and semi-skilled employment opportunities are likely to be available to local residents in the area, specifically residents from Prieska and Marydale. The majority of the beneficiaries are therefore likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the SEF and associated infrastructure.

The capital expenditure on completion is anticipated to be in the region of R 1.8 billion for PV Center. The total capital expenditure associated with the four projects combined would therefore be in the region of R 7.2 billion (2013 rand values). In terms of business opportunities for local companies, expenditure during the construction phase will create business opportunities for the regional and local economy. However, given the technical nature of the project and high import content associated with SEF's the opportunities for the local economy and towns of Prieska, Upington, De Aar and Britstown are likely to be limited. However, opportunities are likely to exist for local contractors and engineering companies in Upington and De Aar. The implementation of the enhancement measures listed below can enhance these opportunities.

The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The majority of construction workers are likely to be accommodated in Prieska. This will create opportunities for local hotels, B&Bs, guest farms and people who want to rent out their houses. As indicated above, these benefits will extend over a period of ~ 8 years.

However, based on the information collected during the site visit the accommodation opportunities in Prieska are limited. This is an issue that the proponent will need to discuss with the SLM. The hospitality industry in the local towns is also likely to benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other large construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

Nature: Creation of employment and business opportunities during the construction phase		
	Without Enhancement	**With Enhancement**
Extent	Local – Regional (3)	Local – Regional (4)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (40)	Medium (44)
Status	Positive	Positive
Reversibility	N/A	N/A

Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement : In order to enhance local employment and business opportunities associated with the construction phase the following measures should be implemented:

Employment

- » Where reasonable and practical the contractors appointed by the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
- » Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
- » Before the construction phase commences the proponent and its contractors should meet with representatives from the SLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
- » The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase.
- » Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
- » The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

- » The proponent should seek to develop a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
- » The SLM, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

Cumulative impacts: Opportunity to up-grade and improve skills levels in the area.

Residual impacts: Improved pool of skills and experience in the local area.

b. Presence of construction workers and potential impacts on family structures and social networks – construction phase

The presence of construction workers poses a potential risk to family structures and social networks in the area, specifically local communities in Prieska. While the presence of construction workers does not in itself constitute a social impact,

the manner in which construction workers conduct themselves can affect the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks.

The findings of the SIA indicate that the local farmers in the area are strongly opposed to construction workers being accommodated on the site. In this regard the proponent has indicated that no construction personnel, apart from security, will be accommodated on the site.

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Medium Term for community as a whole (3) Long term-permanent for individuals who may be affected by STD's etc. (5)	Medium Term for community as a whole (3) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	Low for the community as a whole (27) Moderate-High for specific individuals who may be affected by STD's etc. (57)	Low for the community as a whole (24) Moderate-High for specific individuals who may be affected by STD's etc. (51)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: » Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi and low-skilled job categories. This will reduce the potential impact that this category of worker could have on local family and social networks; » The proponent should consider the establishment of a Monitoring Forum (MF) for the		

construction phase. The MF should be established before the construction phase commences and should include key stakeholders, including representatives from the local community, local councillors, farmers, and the contractor. The role of the MF would be to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should also be briefed on the potential risks to the local community associated with construction workers; » The proponent and the contractors should, in consultation with representatives from the MF, develop a Code of Conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the code of good conduct should be dismissed. All dismissals must comply with the South African labour legislation; » The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase; » The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis; » The contractor should make necessary arrangements to enable workers from outside the area to return home over weekends and or on a regular basis during the construction phase. This would reduce the risk posed by non-local construction workers to local family structures and social networks; » The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed. This would reduce the risk posed by non-local construction workers to local family structures and social networks; » As per the agreement with the local farmers in the area, no construction workers, will be permitted to stay overnight on the site. Security personnel will be housed in the vicinity of the site.
Cumulative impacts: Impacts on family and community relations that may, in some cases, persist for a long period. 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. The development of other solar energy projects in the area may exacerbate these impacts.
Residual impacts: Community members affected by STDs etc. and associated impact on local community and burden services etc.

c. Influx of job seekers – construction phase

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. While the proposed Bosjesmansberg Solar Energy Facility may, on its' own, not result in influx of significant numbers of job seekers to Prieska, the establishment of a number of solar and other renewable energy projects in the area has the potential to attract job seekers to the area. As in the

case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can affect the local community. There is also a concern that some of these job seekers may not leave town immediately and, in some cases, may stay indefinitely.

The potential social impacts associated with the influx of job seekers include:

- Impacts on existing social networks and community structures;
- Competition for housing, specifically low cost housing;
- Competition for scarce jobs;
- Increase in incidences of crime;
- An increase in sexually transmitted diseases (STDs).

These issues are similar to the concerns associated with the presence of construction workers. However, in some instances the potential impact on the community may be greater given that they are unlikely to have accommodation and may decide to stay on in the area. In addition, they will not have a reliable source of income. The risk of crime associated with the influx of job seekers it therefore likely to be greater.

Experience from other projects has also shown that the families of job seekers may also accompany individual job seekers or follow them later. In many cases the families of the job seekers that become "economically stranded" and the construction workers that decided to stay in the area, subsequently moved to the area. The influx of job seekers to the area and their families can also place pressure on the existing services in the area, specifically low income housing and schools. In addition to the pressure on local services the influx of construction workers and job seekers can also result in competition for scarce employment opportunities. Further secondary impacts include an increase in crime levels, especially property crime, because of the increased number of unemployed people. These impacts can result in increased tensions and conflicts between local residents and job seekers from outside the area.

The key lesson from other large construction projects is the importance of developing and implementing a well-structured recruitment strategy aimed at employing locals and minimising the number of job seekers moving into the area. The SLM should also anticipate that the support for renewable energy projects in the SLM has the potential to result in the influx of job seekers to the area. This influx and the demand that is may have on local services should be borne in mind when the IDP is reviewed and up-dated. In this regard the SLM have recognized the potential risk posed by the influx of job seekers to the area and this is

reflected in the latest IDP. However, the influx of job seekers to the area is likely to pose a significant challenge and will need to be managed carefully.

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Moderate for the community as a whole (6) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	Medium for the community as a whole (42) Medium -High for specific individuals who may be affected by STD's etc. (54)	Medium for the community as a whole (33) Medium-High for specific individuals who may be affected by STD's etc. (51)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	Yes, to some degree. However, the risk cannot be eliminated

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job, specifically given that the PKSDM and SLM have identified renewable energy as a future growth sector. However, as indicated above, the proponent should ensure that the employment criteria favour local residents in the area. In addition the proponent should:

- In consultation with the SLM, investigate the option of establishing a MF (see above) to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;
- Implement a policy that no employment will be available at the gate. This

should be linked to the establishment of employment offices in Prieska and other towns in the SLM.
Cumulative impacts: Impacts on family and community relations that may, in some cases, persist for a long period. 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.
Residual impacts: Community members affected by STDs etc. and associated impact on local community and burden services etc.

d. Loss of farm labour – construction phase

Experience from other projects indicates that the loss of farm workers is an issue of concern. In most instances local farmers are unlikely to be in a position to compete with the salaries offered by the renewable energy companies during the construction phase. As a result farm labourer's may be tempted to resign from their current positions on farms. The loss of skilled and experienced farm labour would have a negative impact on local farmers.

The potential impacts for the affected farmers associated with the loss of permanent farm labour to the construction phase are exacerbated by the security of tenure that permanent farm labourers enjoy in terms of the Extension of Security and Tenure Act (ESTA). Farm labourers who are eligible under ESTA and who take up jobs during the construction phase will be entitled stay on in their houses on the farms in question. The net effect is that the farmer may have to incur costs associated with the construction of new dwellings for new labour appointed to replace the labour lost to the construction phase. The farmer may also have to continue subsidizing services such as potable water to people who are no longer in his employ.

While the proposed PV Center facility on its own is unlikely to result in a significant loss of farm labour, the proposed establishment of a number of renewable energy projects in the area has the potential to impact on the farming sector. However, at the end of the day farm labour can be replaced. The potential impacts on farm operations are therefore likely to be temporary. In addition, the findings of the SIA indicate that the farming activities in the area are not labour intensive.

The farm workers that take up jobs during the construction phase are also at risk. While some farm workers may be re-employed once the construction has been completed, others may not be so fortunate. The low education levels associated with the farm worker community would effectively mean that alternative employment opportunities outside the agricultural sector will not be accessible to

them. These farm workers and their families therefore stand to be negatively impacted upon in the medium to long term. The low education levels of local farm workers are however also likely to reduce the chances of them being employed during the construction phase.

On the positive side, some farm workers may view work associated with the construction phase as an opportunity to gain skills and relocate to Prieska and other towns in the area.

Nature: Potential impact on local farmers associated with loss of farm labour to the construction phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (2)	Local and Regional (1)
Duration	Medium Term (3) (Assumed that farm labour can be replaced)	Medium Term (3) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	Yes, if farm workers return of are replaced	Yes, if farm workers return of are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: Refer to specialist Social Report		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: Increase in unemployment amongst local farm workers who are not rehired once construction worker comes to an end. On positive side, may result in increased skills for local farm workers and improve their economic mobility.		

e. Risk of stock theft, poaching and damage to farm infrastructure – construction phase

The presence of construction workers on the site increases the potential risk of stock theft and poaching. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Livestock and game losses may also result from gates being left open and/or fences being damaged. The local farm owners in the area who were interviewed indicated that stock theft was currently not a major

concern. However, there are isolated cases involving the theft of sheep. However, concerns were raised regarding the presence of construction workers in the area. In this regard the local farmers noted that no construction workers should be allowed to stay on the site overnight with the exception of security personnel.

Nature: Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	Yes, compensation paid for stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes
Mitigation: Refer to specialist report		
Cumulative impacts: No**,** provided losses are compensated for		
Residual impacts: Not applicable if losses are compensated for		

f. Risk of veld fires – construction phase

The presence of construction workers and construction-related activities on the site poses an increased risk of veld fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened. While fire was not identified as a key concern, some of the local farmers in the area indicated that fires did occur in the area at least once a year.

- The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, windy winter months.
- The dominant agricultural activity in the broader area is stock farming (sheep, cattle and goats). As such, the livelihoods of the farmers in the

area are dependent on grazing on their farms. Any loss of grazing due to a fire would therefore impact negatively on the affected farmers livelihoods;

» The risk of fire related damage is exacerbated by the limited access to fire-fighting vehicles.

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires		
	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate due to reliance on livestock for maintaining livelihoods (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and losses and damage etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: Refer to specialist report		
Cumulative impacts: No, provided losses are compensated for.		
Residual impacts: Potential loss of income and impact on livelihoods and economic viability of affected farms.		

g. Impacts associated with construction related activities – construction phase

Construction related activities, including the movement of vehicles can generate noise, dust and safety impacts. Mr Pieter Fourie also raised the issue of construction dust. Based on current experience the construction of the 19.5 MW Vogelstruisbult SEF has created significant dust impacts for downwind farmers and has also impacted on grazing. Nelspoortjie, Bosjesmansberg Annexe and Jakkalswater could potentially be affected by dust from the proposed project.

The main access to the site will be via the R357. The findings of the SIA indicate that the volume of traffic along this road is low. The social impacts associated with the movement of construction related traffic along this road are therefore likely to be low.

However, the movement of large, heavy loads during the construction phase has the potential to create delays and safety impacts for other road users travelling along either of the two routes. These impacts can however be mitigated by timing the trips to avoid times of the year when traffic volumes are likely to be higher, such as start and end of school holidays, long weekends and weekends in general etc. In this regard the PKSDM SDF identifies Prieska as a potential tourist node and the R357 as a scenic route.

The option of railing material from Port Elizabeth to should be investigated. This would reduce the potential impact on other road users along the N10. Based comments from other renewable energy projects near De Aar, Mr. Bangani (NAFCOC representative) and Mr Jack (ELM IDP and LED Manager), both indicated that that the option of using rail to transport equipment to the PKSDM should be investigated. Mr Bangani indicated that the establishment proposed of a Renewable Energy Hub centred in the vicinity of De Aar also created an opportunity to revitalise the railway sector in De Aar. This could also benefit the establishment of a Renewable Energy Hub in the SLM.

Nature: Potential noise, dust and safety impacts associated with construction activities and movement of construction related traffic to and from the site		
	Without Mitigation	**With Mitigation**
Extent	Local-Regional (2)	Local-Regional (1)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: The proponent should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes damage to local roads by		

construction vehicles. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include: » Clearing for the establishment of the SEF should be phased to minimise the area that is cleared at any given time. Progressive rehabilitation should be implemented as part of the rehabilitation programme; » Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher, such as start and end of school holidays, long weekends and weekends in general etc.; » The contractor must ensure that all damage caused to local farm roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor; » 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; » All vehicles must be road-worthy and drivers must be qualified, made aware of the potential road safety issues, and need for strict speed limits. In addition, it is recommended that the proponent investigate the option of using rail to transport materials and equipment from Port Elizabeth to Prieska via De Aar.
Cumulative impacts: If damage to roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage.
Residual impacts: Reduced quality of road surfaces and impact on road users

h. Loss of farmland – construction phase

The activities associated with the construction phase have the potential to result in the loss of land available for grazing. However, the farm owner indicated that the project would not affect his farming activities as he had sufficient veld to graze his livestock. In addition, only one landowner is affected and he would have entered into a lease agreement with the proponent. The loss of productive farmland would therefore be offset by the income from the lease agreement.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase.

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the PV facility and power lines will damage farmlands and result in a loss of farmlands for future farming activities.		
	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated or compensation is not paid (5)	Medium Term if damaged areas are rehabilitated (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (28)
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: Refer to specialist Social Report		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmer, and the workers on the farm and their families. However, disturbed areas can be rehabilitated and loses would be off-set by compensation		
Residual impacts: Land would be available for farming once rehabilitation has been completed.		

i. Creation of employment and business opportunities – operational phase

Based on the information from other SEF projects there are ~ 60 permanent employment opportunities associated with a 75 MW SEF during the 20 year operational phase. The total number of employment opportunities created by a 300 MW SEF will therefore be in the region of 220. This assumes that some of the roles can be shared. Of this total ~ 100 (50%) will be low skilled (security and maintenance), 34 (17%) semi-skilled and 66 (33%) skilled employees. Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the

high unemployment levels and limited job opportunities in the area this will represent a social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with people from outside the area.

The proponent has indicated that they are committed to implementing a training and skills development programme during the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the SLM IDP.

Given the location of the proposed facility the majority of permanent staff is likely to reside in Prieska. In terms of accommodation options, a percentage of the non-local permanent employees may purchase houses in one of these towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy, which will benefit local businesses in these towns. The benefits to the local economy will extend over the operational lifespan of the project. However, as indicated earlier there is a housing backlog in Prieska. This is an issue that the proponent will need to address in consultation with the SLM.

The local hospitality industry in Prieska is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

Mr Basson (SLM IDP and LED Manager) indicated that proposed establishment of renewable energy facilities in the area was strongly supported by the SLM. In this regard the municipality had identified the establishment of a renewable energy as one of the key economic opportunities for the area. The proposed establishment of a renewable energy hub would create employment and skills development opportunities, which in turn would assist to address unemployment and create opportunities for local businesses. Due the large number of renewable energy facilities proposed in the SLM it is recommended that the SLM investigate the option of establishing a forum to assist the renewable energy sector with the establishment of Community Trusts. This would enable the SLM to ensure that the various Community Trusts established as per the requirements set out by the Department of Energy are aligned with and support the developmental objectives set out in the SLM's Integrated Development Plan (IDP) and Local Economic Development (LED) strategy.

Nature: Creation of employment and business opportunities associated with the

operational phase		
	Without Mitigation	**With Enhancement**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	Medium (33)	Medium (48)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: Refer to specialist Social Report		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: Creation of pool of people with experience in field of SEFs who are economically mobile		

j. Benefits associated with the establishment of a community trust – operational phase

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy. Given the size of the Bosjesmansberg SEF (300 MW), the revenue generated for the Community Trust will be significant.

Community trusts provide an opportunity to generate a reliable and steady revenue stream over a 20 year period. This revenue can be used to fund development initiatives in the area and support the local economic and community development. The 20 year timeframe also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed SEF can be used to support a number of social and economic initiatives in the area, including:

- Education (adult and child);
- Health care;

- Training and skills development;
- Support for SMME's.

The SLM IDP and LED Manager, Mr Basson, also indicated that the revenue from renewable energy projects should also be used to address the infrastructure backlogs in the SLM. As indicated above, the SLM should investigate the option of establishing a forum to assist the renewable energy sector with the establishment of Community Trusts. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

Nature: Establishment of a Community Trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development		
	Without Mitigation	**With Enhancement**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	Medium (36)	High (65)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: Refer to specialist Social Report		
Cumulative impacts: Promotion of social and economic development and improvement in the overall well-being of the community		
Residual impacts: Investment in local economic development in the area that would benefit the community post operational phase		

k. Development of clean, renewable energy infrastructure– operational phase

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The establishment of a clean, renewable energy facility will therefore reduce, albeit

minimally, South Africa's reliance on coal-generated energy and the generation of carbon emissions into the atmosphere.

The overall contribution to South Africa's total energy requirements of the proposed SEF is relatively moderate. However, the 300 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

Nature: Promotion of clean, renewable energy		
	Without Mitigation	**With Mitigation** (The provision of renewable energy infrastructure is in itself a mitigation measure)
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (48)	Medium (48)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: Refer to specialist Social Report		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: Not applicable after decommissioning		

l. Influx of job seekers to the area – operational phase

While the proposed SEF on its own is unlikely to result in a significant influx of job seekers during the operational phase, the proposed establishment of a number of renewable energy projects in and around Prieska is likely to attract job seekers to the area. These issues are similar to the concerns associated with the influx of jobs seekers during the construction phase and include:

- Impacts on existing social networks and community structures;
- Competition for housing, specifically low cost housing;
- Pressure on local services, such as schools, clinics etc.;
- Competition for scarce jobs;
- Increase in incidences of crime;
- Increase in transmission of STD's etc.

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	Medium for the community as a whole (33) Medium -High for specific individuals who may be affected by STD's etc. (51)	Low for the community as a whole (27) Medium-High for specific individuals who may be affected by STD's etc. (51)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: Refer to specialist Social Report		
Cumulative impacts: Impacts on family and community relations that may, in some cases, persist for a long period. 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.		
Residual impacts: Community members affected by STDs etc. and associated impact on		

local community and burden services etc.

m. <u>Impact on local services and capacity of SLM – operational phase</u>

The rapid growth in the town linked to the renewable energy sector is likely to impact on local services. In addition, the capacity and ability of the SLM to manage the increased pressure on services such bulk water reticulation, sewage treatment, waste collection and disposal, maintenance of roads etc. was identified as a key issue of concern. The SLM has also identified capacity within the SLM as a key issue.

In addition to the services provided by the SLM, the rapid growth of Prieska will also impact on other key community services, such as schools, police, hospitals, clinics and emergency services. The demand placed on available accommodation in the town will also push up rental rates and make it increasingly difficult for government officials, such as teachers, municipal employees, etc., to afford rentals in the town. Similar experiences have occurred in Postmasburg and Sishen due to the mining sector.

Nature: The rapid expansion of Prieska will place pressure on existing services and the capacity of the SLM		
	Without Mitigation	**With Enhancement (Assumes increased capacity of SLM etc. and additional resources)**
Extent	Local-Regional (3)	Local – Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (52)	Medium (52)
Status	Negative	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	Yes
Enhancement: Refer to specialist Social Report		
Cumulative impacts: Negative, decreasing quality of services and impact on local economy and residents. Positive, improved quality of services and capacity and positive impact on local economy		

Residual impacts: See cumulative impacts

n. Loss of farm labour – operational phase

Experience from other projects indicates that the loss of farm workers is an issue of concern. In most instances local farmers are unlikely to be in a position to compete with the salaries offered by the renewable energy companies. As a result farm labourers may be tempted to resign from their current positions on farms. The loss of skilled and experienced farm labour would have a negative impact on local farmers. The potential impacts for the affected farmers associated with the loss of permanent farm labour are exacerbated by the security of tenure that permanent farm labourers enjoy in terms of the Extension of Security and Tenure Act (ESTA). Those farm labourers which are eligible under ESTA and who take up jobs during the construction phase are entitled stay on in their houses on the farms in question. The net effect is that the farmer may have to incur the costs associated with the construction of new dwellings for new labour appointed to replace the labour lost to the renewable energy sector.

While the proposed SEF on its own is unlikely to result in a significant loss of farm labour, the proposed establishment of a number of renewable energy projects in the area has the potential to impact on the farming sector. However, at the end of the day farm labour can be replaced. The potential impacts on farm operations are therefore likely to be temporary.

However, at the same time the employment opportunities associated with the renewable energy sector may offer local farm workers with an opportunity to get better paid jobs which would benefit them and their families. These jobs may also enable them to move of the farms and into Prieska and other local towns, which would improve their access to services such as schools and clinics etc. This would represent a positive social benefit for the farm workers in question.

Nature: Potential impact on local farmers associated with loss of farm labour to the operational phase		
	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)

Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	Yes, if farm workers return or are replaced
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: Refer to specialist Social Report		
Cumulative impacts: Impacts on farm operations due to loss of experienced farm labour		
Residual impacts: Not applicable		

o. Visual impact and impact on sense of place – operational phase

The components associated with the proposed SEF will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, unlike wind energy facilities, the impact associated with SEFs is lower due to the significantly lower height of the solar panels and infrastructure.

Based on the findings of the SIA the proposed SEF will be screened from the R357 by the natural topography and vegetation. The area is also sparsely populated. The potential visual impact on adjacent farm houses is therefore limited. In addition, there are a number of renewable energy projects proposed in the immediate vicinity of the proposed site, including a wind energy facility. The visual quality of the area has also been impacted by two Eskom substations and associated transmission lines and the Copperton Mine and associated mine infrastructure, overburden dumps and slimes dams. The significance of the impact on the areas sense of place is therefore likely to be low.

The findings of the SIA also found that none of the local landowners in the vicinity of the site who were interviewed indicated that they were they opposed to the proposed development and or concerned about the potential impact on the areas sense of place.

Nature: Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)

Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (27)
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: Refer to specialist Social Report		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: Not applicable as impact is removed		

p. Impact on tourism – operational phase

The Northern Cape PGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile ecosystems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Therefore caution must be taken to ensure that the development of renewable energy projects, such as the proposed SEF, do not impact negatively on the tourism potential of the Province.

In terms of the site, the PKSDM SDF identifies Prieska as a potential tourism node and the R357 as a scenic route. However, based on the findings of the site visit, the proposed facility is not likely to impact on the tourism sector in the area or the Province. The potential impact on the tourism sector in the area was not raised as a concern by IDP Manager for the SLM, Mr Basson. The significance of this issue is therefore rated as Low negative. The findings of the SIA also indicate that the establishment of the proposed SEF may also attract tourists to the area. However, the significance of this potential benefit is also rated as Low positive.

Nature: Potential impact of the PV facility on local tourism		
	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)

Significance	Low (24) (Applies to both – and +)	Low (27) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: Refer to specialist Social Report		
Cumulative impacts: Potential negative and or positive impact on tourism in the SLM		
Residual impacts: Not applicable as impact is removed		

6.3. Summary of All Impacts

The following table provides a summary of the impact rating of the potential impacts for both the construction and operational phases identified and assessed through the EIA.

Nature	*Positive (+) or Negative (-) Impact*	*Without mitigation*	*With mitigation*
Impacts on Ecology			
Impacts on vegetation and listed plant species may occur as a result of preconstruction activities.	-	Medium-high	Low
Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction.	-	Medium	Low
The operation and presence of the facility may lead to disturbance or persecution of fauna.	-	Medium	Low
Increased erosion risk as a result of soil disturbance and loss of vegetation cover as well as increased runoff generated by hardened surfaces such as roads.	-	Low	Low
Increased erosion risk as a result of soil disturbance and loss of vegetation cover as well as increased runoff generated by the panels, service and access roads.	-	Medium	Low
Construction will lead to some direct or indirect loss of or damage to dry river beds and non-perennial drainage lines or some changes to the catchment of these areas.	-	Low	Low
Alien plants are likely to invade the site as a result of the large amounts of disturbance created during construction	-	Medium	Low
Impacts on Avifauna			
Habitat loss	-	Medium	Low
Disturbance during construction	-	Medium	Medium
Disturbance during operation	-	Low	Low
Impacts on Soils and Agricultural Potential			
Direct occupation of land by footprint of energy facility infrastructure and having the effect of taking affected portions of land out of agricultural production.	-	Medium	Medium
Alternative land use of energy facility rental on low productivity agricultural land in combination with continued farming on the	+	Medium	Medium

Nature	*Positive (+) or Negative (-) Impact*	*Without mitigation*	*With mitigation*
rest of the farm and having the effect of providing land owners with increased cash flow and improved rural livelihood.			
Alteration of run-off characteristics due to hard surfaces and access roads and having the effect of loss and deterioration of soil resources.	-	Low	Low
Poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and having the effect of loss of soil fertility on disturbed areas after rehabilitation.	-	Low	Low
Trampling due to vehicle passage in non-approved areas of the site.	-	Low	Low
Accidental spillages of hazardous substances and other pollutants (e.g. fuel, oil, chemicals, cement) onto soil resulting in contamination of the soil due to poor management practices during the construction and decommissioning phases.	-	Low	Low
Potential Heritage Impacts			
During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects which have been identified.	-	Medium	Low
Potential Visual Impacts			
Visual impact on sensitive visual receptors in close proximity to facility	-		
Visual impact on sensitive visual receptors within the region	-		
Lighting Impacts	-		
Potential Social Impacts During Construction			
Creation of employment and business opportunities	+	Medium	Medium
Presence of construction workers and potential impacts on family structures and social networks	-	Low	Low
Influx of job seekers	-	Low	Low
Loss of farm labour	-	Low	Low
Risk of stock theft, poaching and damage	-	Medium	Low

Nature	*Positive (+) or Negative (-) Impact*	*Without mitigation*	*With mitigation*
to farm infrastructure			
Risk of veld fires	-	Medium	Low
Impacts associated with construction related activities	-	Low	Low
Loss of farmland	-	Medium	Low
Potential Social Impacts During Operation			
Creation of employment and business opportunities	+	Medium	Medium
Establishment of Community Trust	+	Medium	High
Establishment of infrastructure for the generation of renewable energy	+	Medium	Medium
Impact on municipal services and capacity	-	Medium	Medium
Influx of job seekers	-	Medium	Low
Loss of farm labour	-	Low	Low
Visual impact and impact on sense of place	-	Medium	Low
Impact on tourism	+ and -	Low	Low

As can be seen from this table, after the use of mitigation measures there are no negative impacts of high significance expected to be associated with the proposed facility provided that the recommended mitigation measures are implemented. All identified impacts can be mitigated to acceptable levels.

ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS AND THE NO-GO ALTERNATIVE *CHAPTER 7*

Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R543) as meaning "the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area".

There has been a substantial increase in renewable energy developments recently in South Africa as legislation is evolving to facilitate the introduction of Independent Power Producers (IPPs) and renewable energy into the electricity generation mix. Due to the recent substantial increase in interest in renewable energy developments in South Africa, it is important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts are considered and avoided where possible.

The Department of Energy has, under the REIPPP Programme released a request for proposals (RfP) to contribute towards Government's renewable energy target of 3725 MW (1450 MW of which has been allocated to solar PV energy) and to stimulate the industry in South Africa. The bid selection process will consider the suggested tariff as well as socio-economic development opportunities provided by the project and the bidder.

There is a legislated requirement to assess cumulative impacts associated with a proposed development. This chapter looks at whether the proposed project's potential impacts become more significant when considered in combination with the other known or proposed solar farm projects within the area.

7.1 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[9].

Significant cumulative impacts that could occur due to the development of the solar energy facilities and its associated infrastructure in proximity to each other include impacts such as:

[9] Definition as provided by DEA in the EIA Regulations.

» Loss of vegetation and impacts on ecology
» Impacts on avifauna
» Soil and agricultural potential impacts
» Heritage impacts
» Visual impacts
» Social impacts

The cumulative effect or impacts are presented as follows:

» Cumulative impacts potentially occurring due to the cumulative effects of the Bosjesmansberg PV Center Solar Energy Facility added to all other renewable energy facilities proposed to be developed in the Copperton area. These impacts will be registered throughout the Copperton area requiring mitigation through planning at a municipal level.
» Cumulative impacts potentially occurring due to the cumulative effects of each 75MW PV facilities proposed to be located on Portion 1 of the Farm Bosjesmansberg 67 (PV Center, PV East, PV West and PV South). These impacts will be registered within the boundaries of the greater farm with the potential to affect other areas off-site.

7.2 Cumulative impacts of renewable energy facilities in the region

Four large renewable energy facility applications have been identified within the Copperton area. These include the Garob Wind Energy Facility (bordering the Bosjesmansberg farm to the west), the Copperton Wind Energy Facility (closer to Copperton), the Platsjambok PV Solar Energy Facility (further south) and the Klipgats Pan PV Solar Energy Facility (south-west of the Kronos substation). The two latter projects have received environmental authorisations, whilst the former two projects are still under review by the decision-making authorities.

The potential cumulative impacts of the abovementioned projects are increased by the PV facilities proposed to occur on Portion 1 of the Farm Bosjesmansberg 67, which include PV Center, PV West, PV East and PV South. Therefore, there appears to be significant potential for cumulative impacts as a result of similar developments planned to be developed around the renewable energy node of Copperton, where a consolidation of impacts is occurring.

7.2.1 Visual impacts

The cumulative impacts associated with solar and/or wind energy facilities are largely linked to the visual impact on the areas sense of place and landscape character.

The construction of the PV panels together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is especially relevant in light of the other alternative energy facilities proposed in the region.

In this respect, the Environmental Authorisation processes for Copperton Wind Energy Facility are still underway, but Environmental Authorisation has been granted for the Garob, Platsjambok and Klipgats PV facilities.

Considering these facilities, there is no doubt that the addition of the proposed Bosjesmansberg Solar Energy Facility (PV Facility Central) will contribute to the cumulative visual impact within the region. Of note is that should enough alternative energy facilities exist within a region, it begins to be defined by such. Therefore, considering those facilities already in possession of an Environmental Authorisation, the anticipated cumulative impact on the visual quality of the landscape and the Sense of Place of the region will be of moderate significance.

7.2.2 Socio-economic impacts

The proposed Bosjesmansberg Solar Energy Facility together with the establishment of the other renewable energy projects in the area also have the potential to result in significant positive cumulative socio-economic impacts for the SLM. The positive cumulative impacts include creation of employment, skills development and training opportunities (construction and operational phase), creation of downstream business opportunities and stimulation of the local property market. The significance of this impact is rated as High positive with enhancement.

However, the establishment of a large number of renewable energy facilities in the area will also create a number of potential challenges for the SLM. These challenges are linked to provision of services and infrastructure. These challenges will need to be addressed by the SLM to ensure that the benefits associated with the renewable energy sector are maximised for the benefit of the broader community.

7.2.3 Ecological Processes

The renewable energy developments in the area are largely outside of the National Protected Areas Expansion Strategy 2008 (NPAES) focus areas, suggesting that the affected areas are not likely to be considered highly sensitive from a broad-scale conservation perspective. This agrees with observations from the area which suggests that the relatively flat topography of the area and relatively homogenous vegetation are factors which are likely to reduce the overall cumulative impact on the area to a relatively low level in terms of the

potential of the high local development intensity to disrupt broad scale ecological processes. This is in contrast to the area to the east of the study area, towards the N10 where there is a much higher topographic diversity and the value of maintaining an intact landscape is clearly much higher. The cumulative loss of habitat resulting from the current and as well as the other developments in the area are not likely to impact the country's ability to meet conservation targets and objectives as the affected vegetation types are widespread and have been little impacted by transformation to date.

Cumulative negative impacts on ecology related to disturbance and habitat loss may occur during construction. The significance of this impact is expected to be of a low significance with mitigation for each project, through sound environmental management during construction and operation and by formal conservation and active management of the natural areas on site. This will result in the negative impacts on ecosystems on each site being managed to acceptable levels, and therefore in keeping with the principles of sustainable development. With the implementation of good environmental management practise during the life cycle of each project, cumulative impacts on ecology as a result of the establishment of similar facilities will be to an acceptable level.

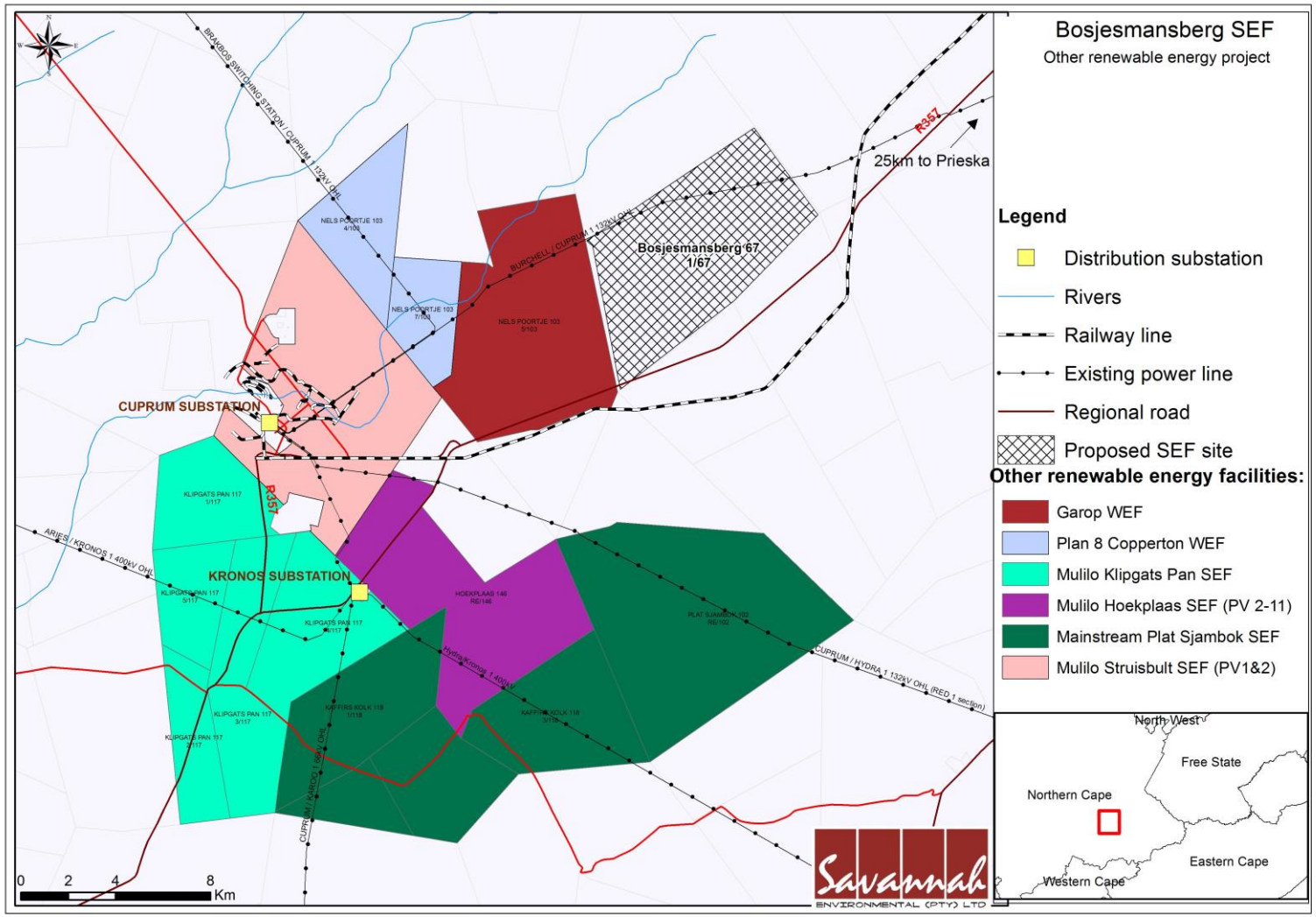

Figure 7.1: Current DEA-registered projects known from the vicinity of the Bosjesmansberg PV Center Solar Energy Facility

7.2.4 Cumulative soil and agricultural impacts

Although the impact of the proposed project on soil and loss of agricultural land available to grazing is of low to medium significance, the cumulative impact on soil and agricultural practices in the area is considered to be more significant. The cumulative impact is however offset by major limitations to agriculture in the area due to the aridity and lack of access to water, as well as the shallow soils prevailing in the area. Generally, land is only suitable for low intensity small stock farming and the cumulative impact is thus expected to be low.

7.2.5 Cumulative Heritage Impacts

Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive. Notably, the area surrounding Copperton is characterised by thousands of square kilometres of land covered by low-density lithic scatter. The potential for the identification of Stone Age artefacts in the region is high. It still remains important for each facility to observe mitigation measures and to incorporate sensitive heritage features into the layout plans where possible.

7.3 Cumulative impacts of 75MW projects on the Farm Bosjesmansberg 67

The potential cumulative impacts over the Farm Bosjesmansberg 67, should the development of all four 75MW PV projects be realised, are likely to be contained to within the boundaries of the farm, and with the application of the necessary mitigation measures, contained within each of the respective 75MW areas. This is deducted based on the following:

- The development footprints of all four PV projects are aligned with areas of low ecological sensitivity and outside of the identified medium sensitive and high to very high sensitive areas.
- Avifauna utilising the farm are not resident within any of the proposed 75MW PV project areas.
- The development footprints are aligned with areas of calcrete characterised by poor soil cover and low agricultural potential.
- Stone Age material is found widespread across the greater farm but is mostly of low heritage significance. All sites identified as conservation worthy have been included as no-go areas within the respective 75MW PV project sites.
- All four sites apart from PV South are situated a minimum distance of 3.5km from the R357 and sensitive visual receptors are virtually absent.

Based on the above, the cumulative impacts associated with the combination of all four projects occurring on Portion 1 of the Farm Bosjesmansberg 67 are

considered to be of low significance provided that environmentall impacts are mitigated to suitable standards.

7.4 Assessment of the Do Nothing Alternative

The 'Do-Nothing' alternative is the option of not constructing the proposed PV Center project. Should this alternative be selected, the predicted environmental impacts will not result. However, the socio-economic and environmental benefits of this renewable energy facility will not be realised and the objectives of the SLM in terms of being a renewable energy hub will be curbed. These benefits include:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.

» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations; this translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.

» **Exploitation of our significant renewable energy resource:** At present, valuable national resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.

» **Pollution reduction:** The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation.

» **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for ~1 % of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

» **Support for international agreements:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.

» **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation in South Africa.

» **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

» **Protecting the natural foundations of life for future generations:** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come.

The 'do nothing' alternative will do little to influence the macro-level renewable energy targets set by government due to competition in the sector, and the number of renewable energy projects being bid to the DoE, specifically around Copperton. However, as the site experiences some of the best irradiation in the country and optimal grid connection opportunities are available, not developing the project would see such an opportunity being lost. The greater farm portion is not being farmed intensively due to climate and agricultural constraints and it is unlikely that the farm will become productive from this perspective in the long-term. The loss of the land to this project is therefore not considered significant. In addition the Northern Cape grid will be deprived of an opportunity to benefit from the additional generated power being evacuated directly into the Province's grid.

The "Do Nothing" alternative is therefore not preferred as South Africa needs to diversify electricity generation sources, to which this project will contribute. From a cumulative perspective, the "Do Nothing" alternative will only be desirable in the event of the SLM failing to respond to the social and infrastructural challenges posed by PV development around Copperton.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 8

This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the development of the facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

Networx is proposing to establish four 75MW commercial photovoltaic solar energy facilities on Portion 1 of the Farm Bosjesmansberg 67 near Copperton. The assessment of impacts of one of the proposed 75MW projects, known as the Bosjesmansberg PV Center Solar Energy Facility, is the subject of this EIA Report. PV Center is located within the Siyathemba Local Municipality in the Northern Cape Province. The purpose of PV Center is to add new capacity for generation of power from renewable energy to the national electricity supply.

PV Center will occupy approximately 220ha of the defined 338ha site initially identified within the northern section of the greater farm portion which is 5 350 ha in extent. The site of PV Center occupies approximately 6.3% of the total site, while the proposed facility footprint will occupy only areas of low environmental sensitivity identified within the project site.

The infrastructure associated with the project includes:

» Arrays of PV panels and respective inverter stations
» Appropriate mounting structures
» Cabling between the project components, to be lain underground where practical
» An on-site substation including a building for control and storage
» An overhead power line to facilitate the connection between the on-site substation and the Eskom grid via a loop in/loop out configuration to the Cuprum-Burchell 132kV power line which traverses the greater farm portion
» Permanent laydown areas
» Laydown areas for the construction phase
» Internal access roads
» Fencing.

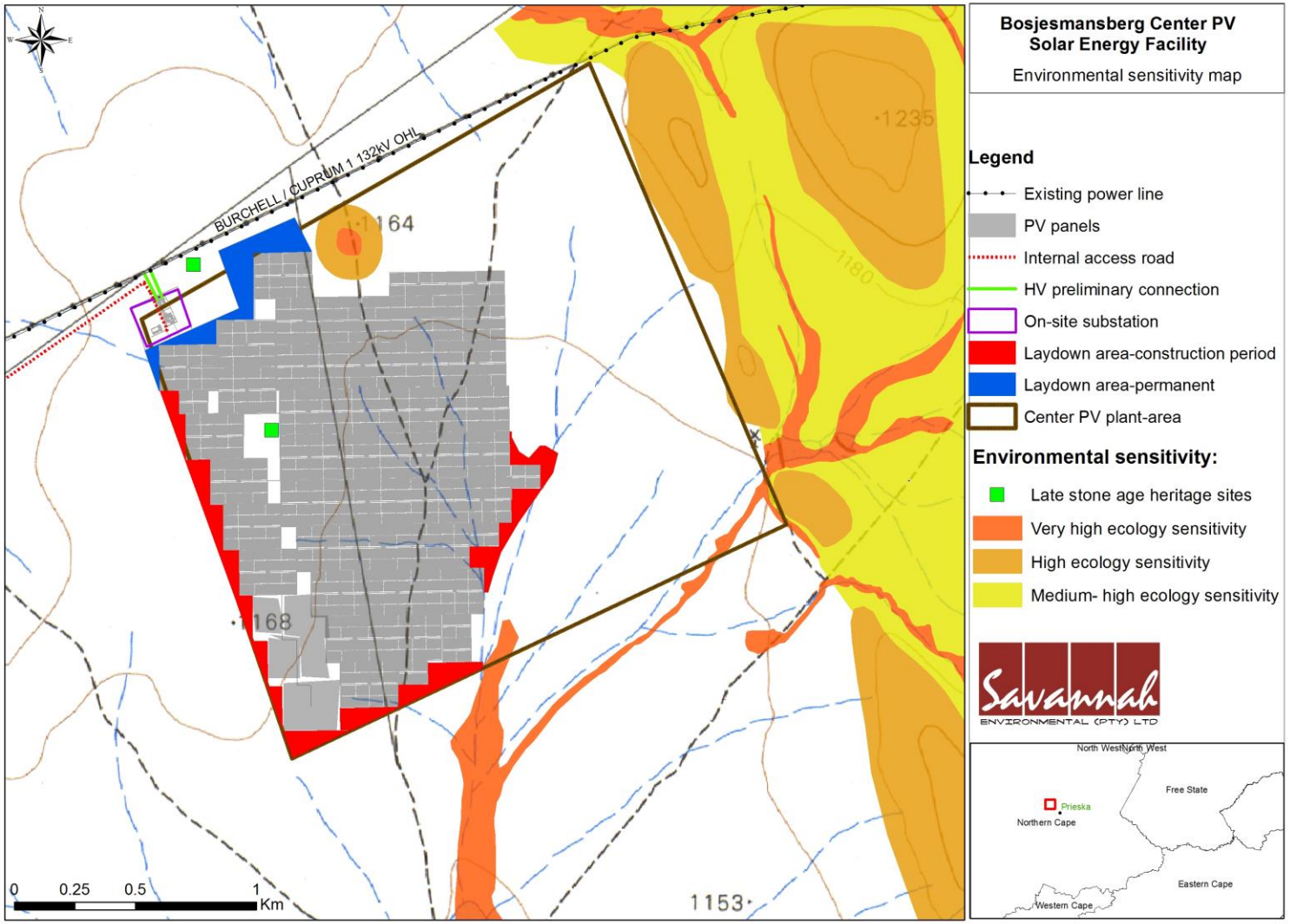

Figure 8.1: Composite environmental sensitivity map for the Bosjesmansberg PV Center Solar Energy Facility illustrating the footprint of the facility within the project site

8.1. Evaluation of the Solar Energy Facility and Associated Infrastructure

The preceding chapters of this report together with the specialist studies contained within Appendices E - K provide a detailed assessment of the potential impacts that may result from the proposed project.

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws associated with the proposed site identified for the development of PV Center. Potential environmental impacts and some areas of high sensitivity were however identified. In summary, the most significant environmental impacts associated with PV Center, as identified through the EIA, include:

» Impacts on ecology and listed floral species.
» Impacts on avifauna.
» Impacts on the local soils, land capability and agricultural potential of the site.
» Visual impacts mainly due to the solar panels and partly due to other associated infrastructure (power line, access road etc.).
» Heritage impacts.
» Social and economic impacts.
» Cumulative impacts.

From the conclusions of the detailed EIA studies undertaken, sensitive areas within the development footprint area were identified and flagged for consideration and avoidance by the facility layout. The most significant environmental impacts identified and assessed to be associated with the proposed PV Center project include:

» Impacts on listed floral species which occur in isolated areas within the site boundaries
» Impacts on Stone Age archaeological material of low significance and widespread throughout the farm.

Other impacts which could have an impact on the environment include:

» Impacts on the local soils, land capability and agricultural potential of the site.
» Visual impacts mainly due to the solar panels and partly due to other associated infrastructure.
» Social and economic impacts.

8.1.1. Impacts on Ecology

Areas of ecological sensitivity within the proposed development site were identified through the EIA process. The ecological sensitivities mapped on the site are shown in the previous chapter and in the facility layout map in Figure 8.1. The ecological sensitivity assessment identified those parts of PV Center that have high conservation value or that may be sensitive to disturbance. The habitats considered most sensitive within the site, but which have been avoided by the design of the facility, include:

» Pans of very high sensitivity
» Drainage lines of high sensitivity
» Grassy shrublands of medium sensitivity
» Washes and pans.

The layout plan has been prepared to fully respond to the identified ecological sensitivities. This has been achieved by locating the PV plant exclusively within areas of low ecological sensitivity and through avoidance of drainage lines, pans and medium sensitive grasslands in the eastern portion of the site.

Overall the impact of the proposed Bosjesmansberg PV Center Solar Energy Facility on ecology has been assessed to be of low significance.

8.1.2. Impact on Soils, Land Capability and Agricultural Potential

The current land use is livestock (sheep) farming on the farm. Four potential negative impacts of the development on agricultural resources and productivity were identified as:

» Loss of agricultural land use caused by direct occupation of land by the energy facility footprint (medium significance with and without mitigation).
» Soil Erosion caused by alteration of the surface run-off characteristics (low significance with and without mitigation).
» Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).
» Degradation of surrounding veld due to vehicle trampling (low significance with and without mitigation).

One potential positive impact of the development on agricultural resources and productivity was identified as:

» Generation of alternative land use income through rental for energy facility on low productivity agricultural land. This will provide land owners with increased cash flow and rural livelihood (low significance with and without mitigation).

The loss of agricultural land has been rated as being of medium significance, due only to the occupation of agricultural land by the PV facility, however all other soil impacts have been rated as low with and without the implementation of mitigation measures.

8.1.3. Visual Impacts

Considering all local and cumulative factors considered, it is concluded that a limited number of sensitive visual receptors will be impacted upon visually should PV Center be developed. It is furthermore concluded that due to the existing disturbances to the visual environment, the significance of anticipated visual impacts are of acceptable significance levels within the receiving environment.

8.1.4. Impacts Heritage on Heritage Resources

Stone Age material is found widespread across the region as well as the greater farm but is mostly of low heritage significance. Some sites however are of higher significance and some mitigation are recommended for these sites. The impacts to heritage resources by the proposed development are not considered to be highly significant and the impact on archaeological sites can very easily be mitigated.

There were two "Heritage Sensitive Areas" worthy of *in-situ* preservation identified on PV Center. These sites have been identified as no-go areas and will be avoided by the project footprint accordingly, although one of the sites will be situated in an open area surrounded by PV panels.

The impact of the project on heritage resource is rated as low significance.

8.1.5. Social and Economic Impacts

The findings of the SIA indicate that the development of the proposed Bosjesmansberg SEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The enhancement measures listed in the report should be implemented in order to enhance these benefits. In addition, the proposed establishment of a number of other renewable energy facilities in the area will create significant socio-economic opportunities for Prieska and the SLM, which, in turn, will result in a positive social benefit. These benefits will assist to offset the negative impacts associated with the decline in the mining sector over the last 20 or so years.

The establishment of a Community Trust funded by revenue generated from the sale of energy from the proposed Bosjesmansberg Solar Energy Facility also creates

an opportunity to support local economic development in the area. Given the cumulative size of the proposed facility (four 75MW projects), this will represent a significant social benefit for an area where there are limited opportunities.

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

However, the potential cumulative impacts associated with wind and solar energy facilities on the areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for renewable energy facilities in the area.

8.2 Comparison of Technology Alternatives

Impacts on the environment associated with the project will be influenced by the type of PV panel array to be used. PV technologies being considered for the proposed project are fixed and tracking, to be developed with a 220ha development footprint. For the majority of impacts, the two alternative PV technologies do not differ in any significant way. Therefore, there is no significant difference in the potential impacts associated with the alternatives. In terms of the specialist studies undertaken, the following conclusions were made regarding the preferred PV technology alternative:

	Fixed	**Tracking**
Ecology	Less preferred	Preferred
Avifauna	No preference	No preference
Soils and agricultural potential	No preference	No preference
Visual	Preferred	Less preferred
Heritage & palaeontology	No preference	No preference
Social	No preference	No preference

- ***Ecology*** – Tracking PV technology is ecologically a preferred technology alternative, due to the aridity of the area and the difficulty of new vegetation establishment, the impact of tracking systems would seem less than that of a fixed panel array, even if the latter may occupy less space.
- **Avifauna** – The two alternative PV technologies do not differ in any significant way as far as avifaunal habitat which they will affect, or the interaction between birds and the infrastructure is concerned.

» **Soils and agricultural potential -** The agricultural potential for this site is low, in terms of impact arising from soils and agricultural potential, there is no significance difference in the potential impacts associated with the two technology alternatives.
» **Visual -** Fixed technology is preferred being that it is less intrusive to sensitive receptors. However, for this particular site there is very little difference in the significance in the potential impacts associated with the two technology alternatives, with views being restricted to within 5km.
» **Heritage and palaeontology -** There is no significance difference in the potential impacts associated with the two technology alternatives as the footprint remains unchanged.
» **Social** - There is no difference in social / economic impacts from either technology alternatives.

There are no impacts of unacceptably high significance associated with either technology alternative assessed for the proposed Bosjesmansberg PV Center Solar Energy Facility. In addition, there is little or no difference between the impacts associated with the two technology alternatives, and there no strong preference for one technology. Both are considered to be environmentally acceptable for implementation at the Bosjesmansberg PV Center Solar Energy Facility.

8.3 Environmental Costs of the Project versus Benefits of the Project

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

» Loss of biodiversity, flora, fauna and soils due to the clearing of land for the construction and utilisation of land for the PV project (which is limited to the development footprint of 220 hectares). The loss of biodiversity has been minimised by the careful location of the development to avoid key areas supporting biodiversity including high and medium sensitive areas.
» Visual impacts associated with the PV panels
» Change in land-use and loss of agricultural land on the development footprint.

These costs are expected to occur at a local level.

Benefits of the project include the following:
» Given the very high level of poverty, unemployment and remoteness as well as the limited range of economic opportunity presented in this arid region, the project is poised to bring about important economic benefit at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development. These will transpire during the preconstruction/ construction and operational phases.

» The project serves to diversify the economy and electricity generation mix of South Africa by addition of solar energy to the mix.
» South Africa's per capita greenhouse gas emissions being amongst the highest in the world due to reliance on fossil fuels, the proposed project will contribute to South Africa achieving goals for implementation of non-renewable energy and 'green' energy. Greenhouse gas emission load is estimated to reduce by 0.86% for a 500MW coal-fired power station compared to a similar MW PV project, on a like for like basis.

The benefits of the project are expected to occur at a national, regional and local level. These benefits partially offset the localised environmental costs of the project.

8.4. Overall Conclusion (Impact Statement)

The technical viability of establishing the Bosjesmansberg PV Center Solar Energy Facility with a generating capacity of up to 75MW on Portion 1 of the Farm Bosjesmansberg 67 has been established by Networx. The positive implications of establishing PV Center include the following:

» Support of the development aspirations of the Siyathemba Local Municipality.
» The project would assist the South African government in reaching their set targets for renewable energy.
» The proposed PV Center project would assist the South African government in the implementation of its green growth strategy and job creation targets.
» Specifically, the project is supported at a National level due to its contribution towards SIP 8 due to the addition of clean energy to the national grid.
» The potential to harness and utilise solar energy resources within the Northern Cape. The National electricity grid in the Northern Cape would benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa
» Creation of local employment, business opportunities and skills development for the area.
» The facility footprint avoids all sensitive areas identified within the landscape.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can be reduced by implementing the recommended mitigation measures. The project is therefore considered to meet the requirements of sustainable development. Environmental specifications for the

management of potential impacts are detailed within the draft Environmental Management Programme (EMPr) for PV Center which is included within Appendix K.

With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

8.5. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the PV Center project and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the identified impacts can be mitigated to an acceptable level. **In terms of this conclusion, the EIA project team support the decision for environmental authorisation**.

The following conditions would be required to be included within an authorisation issued for the project:

- If any protected plant or tree species will be removed/destroyed by the developer, a collection/destruction permit to be obtained from Northern Cape Department of Environment and Nature Conservation and/or DAFF for the protected species found on site. A walk-through survey of the site development footprint will be required prior to construction commencing.
- Compliance with the permitting requirements for listed species identified on the site in terms of the Northern Cape Nature Conservation Act and DAFF must be observed.
- Vegetation clearing may only commence after walk through has been conducted and the necessary permits obtained.
- The draft Environmental Management Programme (EMPr) as contained within Appendix K of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMPr should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices E to J and Appendix P must be implemented.

- An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
- A detailed stormwater management plan must be developed and implemented for the facility following final design.
- A site management plan is required to be prepared by a professional archaeologist for the two heritage sites identified to occur within PV Center.
- Should substantial archaeological or paleontological (fossils) remains be exposed during construction, the ECO should safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.
- Site rehabilitation of temporary laydown and construction areas to be undertaken immediately after construction.
- Should the facility be decommissioned, the development footprint must be rehabilitated.
- Alien invasive vegetation is to be managed or removed (as required) during construction, operations, decommissioning and post-closure of the facility.
- Following the final design of the facility, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
- Applications for all other relevant and required permits required to be obtained by the developer and must be submitted to the relevant regulating authorities.

8.6. Listed activities to be authorised

As indicated in Chapter 1, below follows a concluding statement for each of the listed activities applied for and concludes whether the listed activity should be authorized or not, based on the outcome of the evaluation, impact assessment and relationship of the project footprint to the environment.

The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts

The construction of a 33/132kV 80MVA on-site substation within the PV Center development footprint is an activity which requires authorisation. The construction of a 132kV power line of 150m in length between the on-site substation and the point of connection to the existing Cuprum-Burchell 132kV power line (i.e. the loop in-loop our configuration) is an activity which requires authorisation.

The construction of (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse,

measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

The footprint of PV Center and all associated infrastructure falls outside of ephemeral drainage lines and washes delineated on the project site, but potentially within 32m from such watercourses (where temporary laydown areas are proposed). This activity requires authorisation.

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 or more than 5 cubic metres from (i) a watercourse

No watercourses delineated on the greater farm and PV facility site have been identified as requiring infill infilled or dredged for the removal of material for the construction of the PV array or associated infrastructure. This activity does however require authorisation as the need may arise at some point during construction to obtain materials for construction purposes – specifically for the construction of access roads within the site.

The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres

Newly constructed roads are to be constructed outside of an urban area and will be approximately 3.5m in width. It is not anticipated that internal access roads will at any point equal or exceed 8m in width. This activity **does not** require requires authorisation.

The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.

PV Center will have a generating capacity of up to 75MW. This activity requires authorisation.

Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more

The footprint of the PV array and associated infrastructure will be approximately 220ha in extent. The transformation will be from an agricultural land uses to an industrial land use. This activity requires authorisation.

The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) In Northern Cape: i. All areas outside urban areas

The footprint of PV Center will be located predominantly on calcrete areas of low ecological sensitivity. However 75% of the vegetative cover constitutes indigenous vegetation. This activity for the removal of vegetation requires authorisation.