Final Scoping Report

Proposed 90 MW Graspan Photovoltaic (PV) Power Facility, Northern Cape

Solaire Direct Southern Africa (Pty) Ltd

DEA Ref: 14/12/16/3/3/2/276

May 2012

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Solaire Direct Southern Africa (Pty) Ltd

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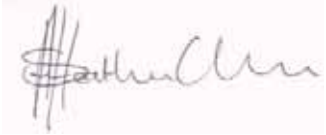
ERM Reference: 0156408

Prepared by: Dean Alborough

For and on behalf of
Environmental Resources Management

Approved by: Stuart Heather-Clark

Signed: 

Position: Partner

Date: 21 May 2012

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ACRONYMS

BID	Background Information Document
DEA	Department of Environmental Affairs
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
ERM	Environmental Resources Management
GN	Government Notice
I&APs	Interested & Affected Parties
IPP	Independent Power Producer
NEMA	National Environmental Management Act
NERSA	National Energy Regulator of South Africa
SAHRA	South African Heritage Resources Agency
ToR	Terms of Reference

ABBREVIATIONS

%	Percent
cm	Centimetres
CO_2	Carbon Dioxide
GWh	Gigawatt Hour
kg	Kilograms
km	Kilometres
km^2	Square kilometres
kV	Kilovolt
m	Metres
MW	Megawatt
m^2	Square meters
R	South African Rand

DEFINITIONS AND TERMINOLOGY

Alternative: A possible course of action, in place of another, that would meet the same purpose and need (of the proposal). Alternatives can refer to any of the following but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.

Cumulative Impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combines to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the same 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' or 'no-go' alternative: The 'do nothing' or 'no-go' alternative is the option of not undertaking the proposed activity or any of its alternatives. This 'alternative also provides the baseline against which the impacts of other alternatives should be compared.

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. This includes the economic, social, cultural, historical and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

Environmental Assessment: The generic term for all forms of environmental assessment for projects, plans, programmes or policies. This includes methods/tools such as environmental impact assessment, strategic environmental assessment, sustainability assessment and risk assessment.

Impact: The positive or negative effects on human well-being and / or on the environment.

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 coordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

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 supplies water to a reservoir that supplies water to that activity). These types if impacts include all of 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 Parties (I&APs): Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by the proposal or activity and/or who are concerned with a proposal or activity and its consequences.

Competent Authority: The environmental authority at the national or provincial level entrusted in terms of legislation, with the responsibility for granting or refusing environmental authorisation in respect of an activity.

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

Scoping: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addresses in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).

Stakeholder engagement: The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.

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ACRONYMS

ABBREVIATIONS

DEFINITIONS AND TERMINOLOGY

1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

Solaire Direct Southern Africa (Solaire Direct) has appointed Environmental Resources Management Southern Africa (Pty) Ltd (ERM), as independent environmental consultants to undertake the Environmental Impact Assessment (EIA) process for the proposed new photovoltaic (PV) power facility located approximately 40km north east of Hopetown in the Northern Cape. It is intended that the electricity generated by the PV power facility will feed into the national power grid through Eskom's Graspan Traction Substation, through an 800m overhead powerline.

This Final Scoping Report has been compiled as part of the Environmental Impact Assessment (EIA) process in accordance with the regulatory requirements stipulated in the EIA Regulations (Government Notice R543) promulgated in terms of Section 24(5) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended. The objectives of this report are to provide information to Interested and Affected Parties (I&AP's), including the public and authorities, on the EIA process followed to date and the proposed project.

The Scoping Report provides a description of the proposed project activities, alternatives considered, the EIA methodology, and issues and concerns identified by the project team and/or raised by I&AP's. A Plan of Study for the EIA, which includes the terms of reference for specialist studies, is also included.

1.2 PROJECT OVERVIEW

Solaire Direct is planning a new photovoltaic (PV) power facility for the generation of solar energy in the Northern Cape. The site is located on the remaining extent of Farm Graspan (No. 172), situated in the Siyancuma Local Municipality in the Northern Cape (see *Figure 5.9*). The proposed development includes the installation and operation of solar PV panels (connected to each other in PV arrays) with a projected output of up to 90 megawatts (MW). It is intended that the electricity generated by the proposed facility will feed into the national power grid network.

The proposed PV power facility will consist of the following:

- PV panels/modules (arranged in arrays);
- PV module mountings;
- DC-AC current inverters;
- New grid connection substation;
- Underground cabling/ overhead power lines;

- On-site buildings (including an operational control centre, office, ablutions and a guard house);
- Access roads and internal road network; and
- Ancillary infrastructure.

In addition associated infrastructure will be required such as a temporary construction camp and meteorological building.

1.3 PROJECT PROPONENT

Solaire Direct Southern Africa (Pty) Ltd is a subsidiary of the Solaire Direct Group, the largest privately owned solar power producer in France. Solaire Direct Southern Africa operates as an independent power producer (IPP) in Southern African Development Community (SADC) countries.

Founded in France in 2006, the Solaire Direct Group has successfully developed, financed and completed 14 solar projects with a total installed capacity of 120 megawatts (MW). The Solaire Direct Group has power generation subsidiaries around the globe including Southern Africa, Northern Africa, India and South America. Furthermore Solaire Direct has a PV module manufacturing subsidiary, Solaire Direct Technologies, located in South Africa.

1.4 DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

1.4.1 ERM Southern Africa

ERM was appointed by Solaire Direct to undertake the EIA for the proposed 90MW PV power facility to be constructed. ERM and specialists appointed by ERM during the course of this EIA have no financial ties to, nor are they a subsidiary, legally or financially, of Solaire Direct. Remuneration for the services by the Applicant (Solaire Direct) in relation to this EIA is not linked to approval by any decision-making authority and ERM has no secondary or downstream interest in the development.

ERM is a global environmental consulting organisation employing over 3,500 specialists in over 145 offices in more than 41 countries. Founded in 1971, ERM has built an organisation based on the supply of a full range of environmental and social policy, scientific, technical, and regulatory expertise. ERM's primary focus is to provide quality work and service to our clients in these areas.

From a regional perspective ERM has been involved in numerous projects in Africa over the past 30 years and in 2003 established a permanent presence in Southern Africa to meet the growing needs of our clients. The Southern African ERM offices are based in Cape Town, Johannesburg, Pretoria and Durban. ERM Southern Africa has a staff complement of over 120 dedicated environmental professionals offering expert skills in EIA, EMP, EMS, risk

assessment, EHS management and auditing, corporate social responsibility and socio-economic impact assessment, climate change services, specialist groundwater services as well as contaminated site management. ERM Southern Africa has recently undertaken a number of EIAs for PV power facilities, including in the Northern Cape, Western Cape and the Free State.

1.4.2 Project Team

The project team includes ERM consultants, support staff and external specialists. Details of the external specialists that form part of the team are provided in *Section 7.3*. Details of ERM's core project team are provided below.

Table 1.1 ERM Core Project Team

Partner in Charge	**Stuart Heather-Clark** BSc Civil Eng (Hons) & MPhil Environmental and Geographical Science University of Cape Town, Registered EAPSA Practitioner, IAIA.
Principal Project Manager	**Tania Swanepoel** BSc Hons (Engineering & Environmental Geology) University of Pretoria, BSc Hons (Geology and Geohydrology), University of the Western Cape, IAIA, Pr Sci Nat.
Project Manager	**Dean Alborough** Bsc Hons (Zoology and Environmental Science) & MSc Environmental Science, University of Cape Town.

The Partner in Charge, Stuart Heather-Clark, is a certified environmental assessment practitioner and the project has been conducted in terms of the code of ethics promulgated by the Certification Board for Environmental Assessment Practitioners of South Africa (EAPSA), which includes a requirement for independence. Stuart has overall responsibility for the team and delivery of the EIA study. Stuart has more than 15 years experience in the field of Impact Assessment in South Africa, and is the Practice Leader for the Impact Assessment and Planning Team in ERM Southern Africa.

The Principal Project Manager, Tania Swanepoel, has over thirteen years of broad-based environmental and consulting experience in South Africa and has worked on a variety of EIA projects including renewable energy facilities, infrastructure developments and oil and gas projects. The Project Manager, Dean Alborough, has more than 4 years of relevant experience in Integrated Environmental Management, and more than 6 years in environmental science. Dean's experience includes larger environmental and social impact assessments (ESIAs), management plans, public participation, environmental site investigations, monitoring, auditing and risk assessments. Dean has been involved in a number of EIAs in the renewables (wind and solar) and in the oil and gas sectors.

1.5 *OPPORTUNITY TO COMMENT ON THE SCOPING REPORT*

Interested and Affected Parties (I&APs) and authorities were provided with an opportunity to comment on any aspect of the proposed activity and the Draft Scoping Report. The Draft Scoping Report was made available at the Kimberley Public Library and on the project website www.erm.com/SolaireDirect/Graspan. A notification letter was sent to registered and identified I&APs to inform them of the release of the Draft Scoping Report and where the report could be reviewed. A public workshop/open day was held in Hopetown on 17 April 2012. The attendance register from the open day in included in *Annex C*.

Comments were provided to ERM at the address, tel. /fax numbers or e-mail address shown below. The comment period was 02 April to 11 May 2012. All stakeholder comments and concerns thus far are captured in this Final Scoping Report (see *Annex D*).

Interested and Affected Parties (I&APs) and authorities are also provided with an opportunity to comment on any aspect of the proposed activity and the Final Scoping Report. The Final Scoping Report has been made available at the Kimberly Public Library and on the project website www.erm.com/SolaireDirect/Graspan. A notification letter has been sent to registered and identified I&APs to inform them of the release of the Final Scoping Report and where the report can be reviewed
Comments can be provided to ERM at the address, tel. /fax numbers or e-mail address shown below. The comment period is from 16 May 2012 to 05 June 2012. All further stakeholder comments and concerns will be captured in the Draft Environmental Impact Report (DEIR).

Attention: Tougheeda Aspeling
Solaire Direct PV Power Facility
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1.6 STRUCTURE OF THIS REPORT

The remainder of this Final Scoping Report is structured as follows:

Table 1.2 Final Scoping Report Structure

Section	Contents
Section 2 Applicable Legislation and Planning Policy	Overview of applicable legislation and policy.
Section 3 EIA Process	Outlines the approach to the EIA study and summarises the process undertaken for the project to date.
Section 4 Project Description	Includes the project justification, a detailed description of the proposed activities and the consideration of alternatives.
Section 5 Environmental and Socio-economic Baseline	Describes the receiving environment, including biophysical and socio-economic aspects.
Section 6 Preliminary Identification of Issues Impacts	Provides a summary of key issues raised and the potential impacts associated with the proposed development.
Section 7 Plan of Study for EIA	Provides concluding comments about the proposed activity and outlines the terms of reference for specialist studies to address identified key issues.
Section 8 Next Steps	Describes the next steps in the EIA process.
Section 9 References	Provides all references used in the Final Scoping Report.

In addition, the report includes the following annexes:

- *Annex A:* Legislative Framework
- *Annex B:* Site Photolog
- *Annex C:* Public Participation Documentation
- *Annex D:* Comments and Responses Report
- *Annex E:* Communication with the DEA
- *Annex F:* Project Infrastructure Specifications

2 APPLICABLE LEGISLATION AND PLANNING POLICY

2.1 APPLICABLE LEGISLATION

The proposed activity is subject to legislative and policy requirements at a national and provincial level. A detailed description of relevant legislation pertaining to the EIA process for the proposed PV power facility project and the permitting thereof, is contained in *Annex A*. This legislation includes the following:

- National Environmental Management Act (Act No. 107 of 1998), as amended and associated EIA Regulations (GN R543, R544, R545 and R546 of June 2010);
- National Environmental Management: Protected Areas (Act No. 57 of 2003);
- National Water Act (Act No. 36 of 1998);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- National Forests Act (No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999);
- Electricity Regulation Act (Act No. 4 of 2006);
- Occupational Health and Safety Act (Act No. 85 of 1993);
- Hazardous Substances Act (Act No. 15 of 1973);
- Conservation of Agricultural Resources Act (Act 43 of 1983);
- Subdivision of Agricultural Land Act (Act No. 70 of 1970);
- Northern Cape Nature Conservation Act (Act No. 9 of 2009); and
- Nature and Environmental Conservation Ordinance 19 of 1974.

The relevant legislation pertaining to the Environmental Authorisation for development is the National Environmental Management Act (NEMA) (No. 107 of 1998) as amended and the Environmental Impact Assessment (EIA) Regulations of 2010 promulgated under NEMA. The relevance of this legislation is summarised below.

2.1.1 *National Environmental Management Act (NEMA)*

NEMA requires that activities be investigated that may have a potential impact on the environment, socio-economic conditions, and cultural heritage. The results of such investigation must be reported to the relevant authority. Procedures for the investigation and communication of the potential impact of activities are contained in Section 24 (7) of the Act.

Section 24(C) of the Act defines the competent decision-making or competent authority which in this case is the national environmental department, the Department of Environmental Affairs (DEA).

2.1.2 EIA Regulations

The EIA Regulations, June 2010 (Government Notice R544, R545 and R546) identify activities which may have a detrimental effect on the environment and the listed activities which may be triggered by the proposed PV power facility. These include:

GN 544:

Activity 10 (i): *'The construction of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts…'*

Activity 11 (xi): *'The construction of 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.'*

Activity 13: *'The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 m^3 but not exceeding 500 m^3.'*

Activity 22 (ii): '*The construction of a road outside urban areas where no reserve exists where the road is wider than 8 metres.'*

Activity 27 (i) & (ii): *'The decommissioning of existing facilities or infrastructure, for (i) electricity generation with the threshold of more than 10MW and (ii) electricity transmission and distribution with a threshold of more than 132kV.'*

GN 545:

Activity 1: *'The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.'*

Activity 8: *'The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.'*

Activity 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; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply.'*

GN 546:

Activity 14: *'The clearing of an area of 5 hectares or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation.'*

Government Notice R543 sets out the procedures and documentation for Scoping and EIA that need to be complied with.

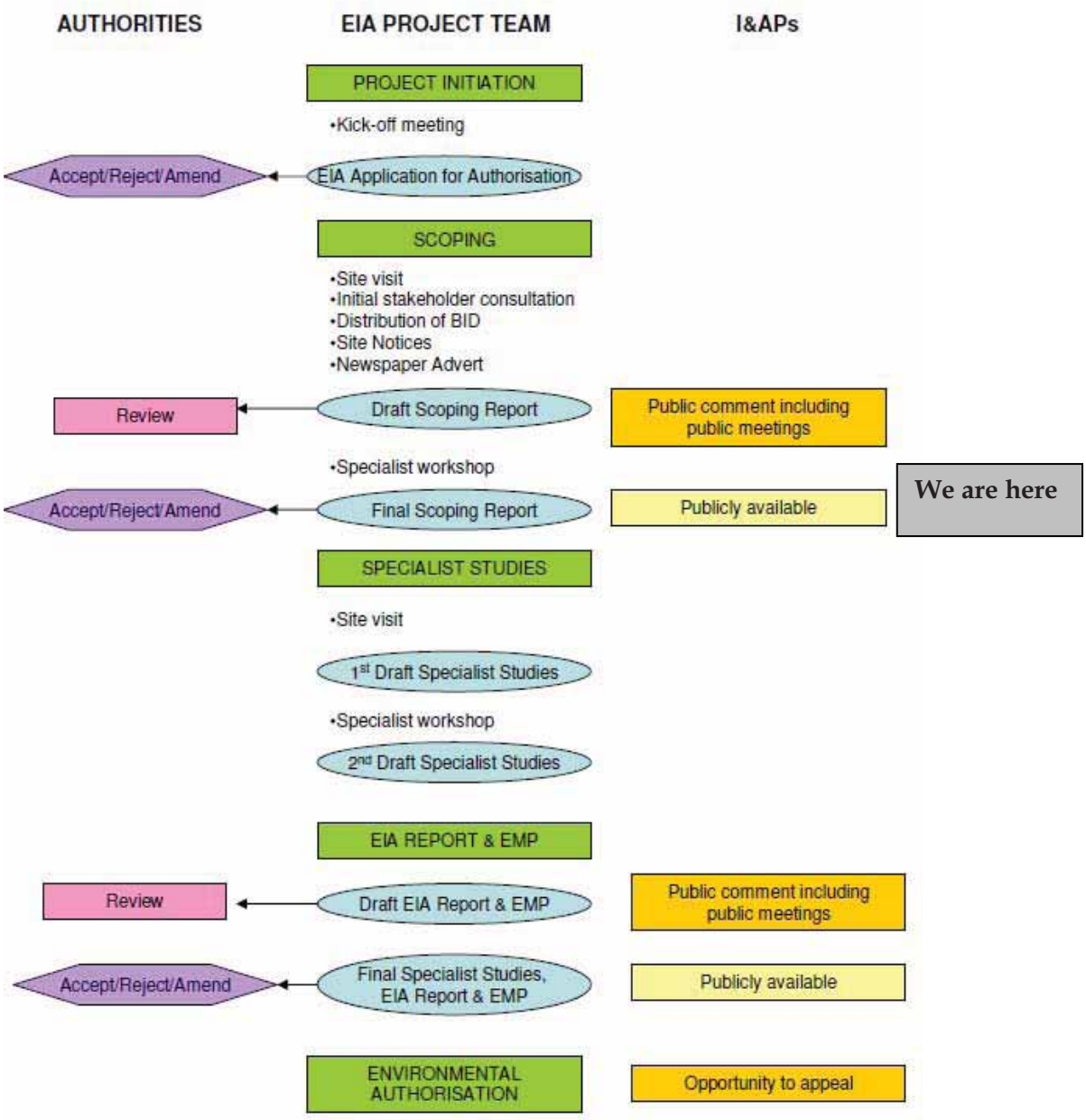
2.2 *REGIONAL PLANNING CONTEXT*

Certain activities related to the proposed development may, in addition to national legislation, be subject to control by municipal by-laws for aspects such as planning, dust, noise and roads, as well as any Pixley Ka Seme District Municipality Integrated Development Plans (IDPs). Relevant legislation, policies and plans will be identified as part of the various specialist studies during the EIA Phase.

The EIA process is illustrated in *Figure 3.1* and consists of the following three phases:

- Scoping Phase;
- Specialist Study Phase; and
- Integration and Assessment Phase.

Figure 3.1 EIA Process Flow Diagram



3.1 SCOPING PHASE

The first phase of the EIA process is a Scoping Study, with an emphasis on public involvement. This project is currently in this phase of the EIA process. The various tasks and consultation activities undertaken thus far by ERM are described and summarised below.

3.1.1 Initial Site Visit and Project Initiation

As part of the project initiation ERM carried out an initial site reconnaissance visit on 1 March 2012. The purpose of the site visit was to familiarise the project team with the project proposal and Study Area and to begin the environmental and social screening and scoping process. Two site notices were erected during the site visit (see *Section 3.1.2* below).

3.1.2 Public Participation

Table 3.1 details the public participation tasks that have been undertaken as part of the Scoping Study.

Table 3.1 Public Participation Tasks: Scoping Phase

Activity	Description and Purpose
Preparation of a preliminary stakeholder database	A preliminary database has been compiled of authorities (local and provincial), Non-Governmental Organisations and other key stakeholders (refer to *Annex C*). This database of registered I&APs will be expanded during the ongoing EIA process.
Erection of site notices	Two on-site notices were placed at the site in 01 March 2012. Further site notices were erected at the Kimberly Public Library and municipal offices, and the Hopetown municipal offices. Photographs showing the site notices are included in *Annex C.*
Distribution of BIDs	Background Information Documents (BIDs) were distributed at the Kimberley Public Library and municipal offices, and the Hopetown municipal offices.
Newspaper Advert	Adverts were placed in the Volksblad and Die Burger newspapers notifying the public of the proposed project and availability of the Draft Scoping Report for comment. Proof of these adverts are included in *Annex C.*
Focus Group Meetings	Focus Group Meetings were held with the surrounding land owners on the 17 April 2012 at the Graspan Farm. Surrounding landowners could voice their concerns about the project. Minutes of the meeting can be found in *Annex C.*
Open House Meeting	An open house was held on the 17 April 2012 at the Hopetown Library Hall where local community members could find out more the project as well as voice any issues of concern. Minutes of the meeting are included in *Annex C.*

3.1.3 Authority Consultation

Authority consultation and involvement up until the release of the Final Scoping Report included:

- Submission of an EIA Application for Authorisation form to DEA on 13 February 2012. DEA's Acknowledgement of Receipt and approval to proceed with the Scoping Study was received on 06 March 2012, DEA Reference 14/12/16/3/3/2/276, and is attached in *Annex E*.

- Acknowledgement of Receipt of the Draft Scoping Report from the DEA was received on 24 April 2012, and is included in *Annex E.*

3.2 SPECIALIST STUDIES PHASE

A number of specialist studies have been identified to address key issues of concern. The findings of these studies will be incorporated into the Environmental Impact Report (EIR). Further information related to the approach to the specialist studies and the impact assessment is contained in the Plan of Study for EIA in *Section 7.*

3.3 INTEGRATION AND ASSESSMENT PHASE

The final phase of the EIA is the Integration and Assessment Phase, which is described in detail in the Plan of Study for EIA (*Section 7)*. The assessment of impacts proceeds through an iterative process considering three key elements:

a) **Prediction of the significance** of impacts that are the consequence of the proposed project on the natural and social environment.
b) **Development of mitigation measures** to avoid, reduce or manage the impacts.
c) **Assessment of residual significant impacts** after the application of mitigation measures.

A synthesis of the specialist studies, which addresses the key issues identified during the Scoping Phase, will be documented in a Draft EIR. Relevant technical and specialist studies will be included as appendices to the Draft EIR. The Draft EIR will be made available to I&APs for a 40-day comment period and registered and identified I&APs will be notified of the release of the Draft EIR and where the report can be reviewed.

Comments received on the Draft EIR will be assimilated and the EIA project team will provide appropriate responses to all comments. A Comments and Responses Report will be appended to the Final EIR, which will be submitted to DEA for decision-making.

All registered I&APs will be notified when an Environmental Authorisation has been issued by the DEA. A 40-day appeal period will follow the issuing of the Environmental Authorisation.

3.3.1 Proposed Timeframe for the EIA

The estimated process schedule for the EIA is presented in *Table 3.2*. *Section 7* of this report presents a more detailed Plan of Study for the EIA.

Table 3.2 Estimated EIA Schedule

Task	Date
Stakeholder Comment on FSR	16 May- 06 June 2012
Acceptance of Scoping Report received from DEA	End June 2012
Specialist Studies	May – July 2012
Prepare Final EIR and EMP	May – July 2012
Stakeholder Comment on Final EIR and EMP	August – mid-September 2012
Finalise and submit EIR and EMP to DEA	Early October 2012

4 PROJECT DESCRIPTION

This Chapter provides an overview of the proposed Solaire Direct Graspan Photovoltaic (PV) Power Facility. Project activities and requirements for the construction, operation and decommissioning of the PV power facility are discussed in this section as well as the motivation for the project and the alternatives considered.

4.1 MOTIVATION

Global dependence on fossil fuels, rising fossil fuel prices and concern regarding the impacts of climate change has resulted in increasing international pressure on countries around the world to increase their share of energy derived from renewable sources. Targets for the promotion of renewable energy now exist in more than 58 countries around the world and solar energy is emerging as an important component of the energy market in a number of countries.

The South African government has developed a policy framework (the White Paper on Renewable Energy) and set a target of sourcing 10,000GWh from renewable energy projects by 2013. This amounts to approximately 4 percent of South Africa's total estimated energy demand by 2013. At the Copenhagen Conference in December 2009 South Africa's president also set a target for the reduction of CO_2 emissions, as laid out in the Integrated Resource Plan (IRP 2010), which sets a target reduction of CO_2 emissions by 34 percent by 2020. The utilisation of renewable energy will play a major role in achieving this goal. South Africa's commitment to achieving this goal was reiterated by Minister Edna Molewa at the December 2010 Climate Change Conference in Cancun, Mexico. At present, South Africa generates approximately 77 percent of its power consumed from coal and as a country, South Africa is among the largest emitters of CO_2 globally.

The potential for the Northern Cape to become a key area for the generation of electricity through solar energy is recognized by the Northern Cape Provincial Government. The Premier of the Northern Cape, Ms H. Jenkins has stated to delegates of the Northern Cape Climate Change and Green Jobs Summit in Upington on 14 April 2011,'*The Northern Cape has been identified as one of the provinces best suited and strategically poised for a number of solar and wind renewable energy projects. These projects will be responsible for creating a number of green jobs in the province and will also be contributing to the clean energy that will be put on to the electricity grid. These projects will also contribute in reducing South Africa's green house gas emissions at a national level.*'

In addition, PV power facilities are more effective where there is a high level of solar radiation. South Africa and more specifically the Northern Cape Province experience's some of the highest levels of solar radiation in the

world. As such, the development of renewable energy projects such as this presents an opportunity for contributing to sustainable development and growth of the province and the country at large.

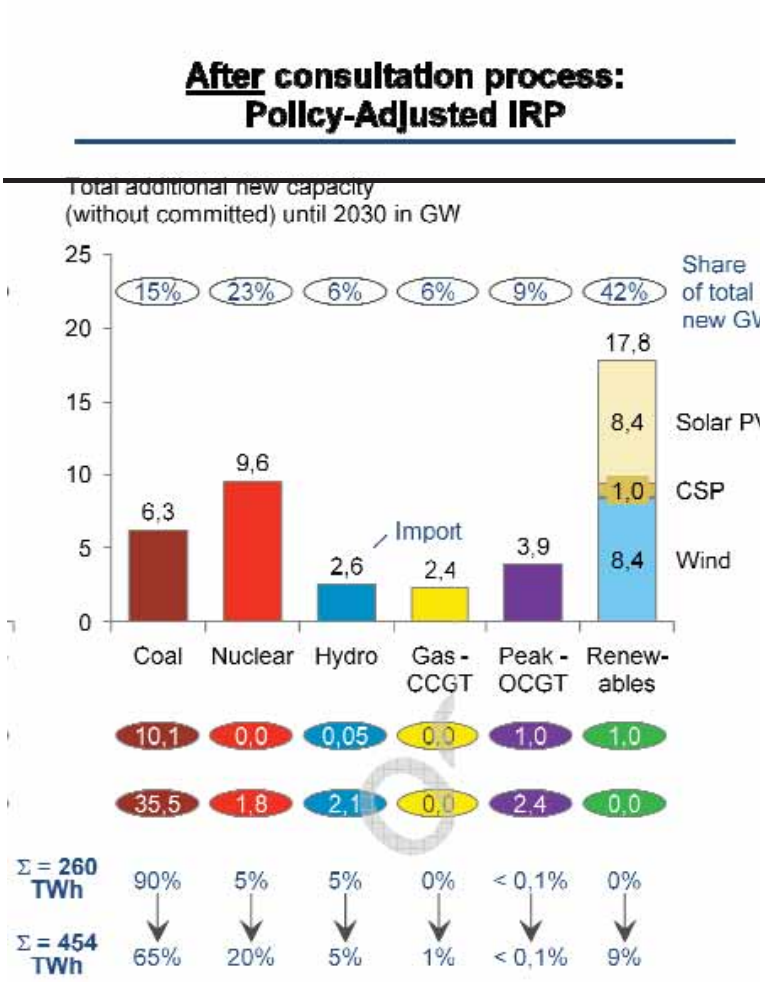
The intentions of Solaire Direct in establishing a PV power facility include reducing South Africa's dependence on non-renewable fossil fuel resources, contributing towards the targets and goals the South African government has set out, and contribute to climate change mitigation.

The Renewable Energy Independent Power Procurement Programme (IPP Procurement Programme) has been designed for the following reasons:

- To allow the private sector to contribute to the generation of renewable energy (and the target set by government);
- To contribute towards socio-economic and environmentally sustainable growth; and
- To enhance the renewable energy sector in South Africa.

Applicants are allowed to submit a proposal for the finance, construction, operation and maintenance of renewable energy facilities. *Figure 4.1* illustrates the total new additional energy capacity needed by 2030, and the different sources of this additional energy.

Figure 4.1 Cabinet Approved Energy Contribution for South Africa from 2010 to 2030



Source: Department of Energy, March 2011.

The cumulative impact of this 90MW development as well as the numerous other proposed solar power facilities in the area may prove significant.

Beyond the positive climate impact however, solar energy is very well placed to rapidly be implemented and contribute to alleviating the power gap in South Africa. Emergency load shedding in South Africa during 2007 and 2008 highlighted the challenges facing South Africa in terms of electricity generation, transmission and distribution. The National Energy Response Plan (NERP), drafted at the time, acknowledged the role that independent power producers (IPPs) (including those harnessing renewable energy resources) can play in ensuring sustainable electricity generation, and sets a goal that 30 percent of all new power generation will be derived from IPPs.

The development of solar energy in the Northern Cape offers the opportunity for a new industry in the province. Existing levels of employment are low within the province and wider site locality. Employment is considered to be the single biggest opportunity outside of the advantages expressed above, associated with the project. Training provided to employees will provide individuals with a skill set that will be highly desirable throughout the industry sector in South Africa as the renewable energy industry and

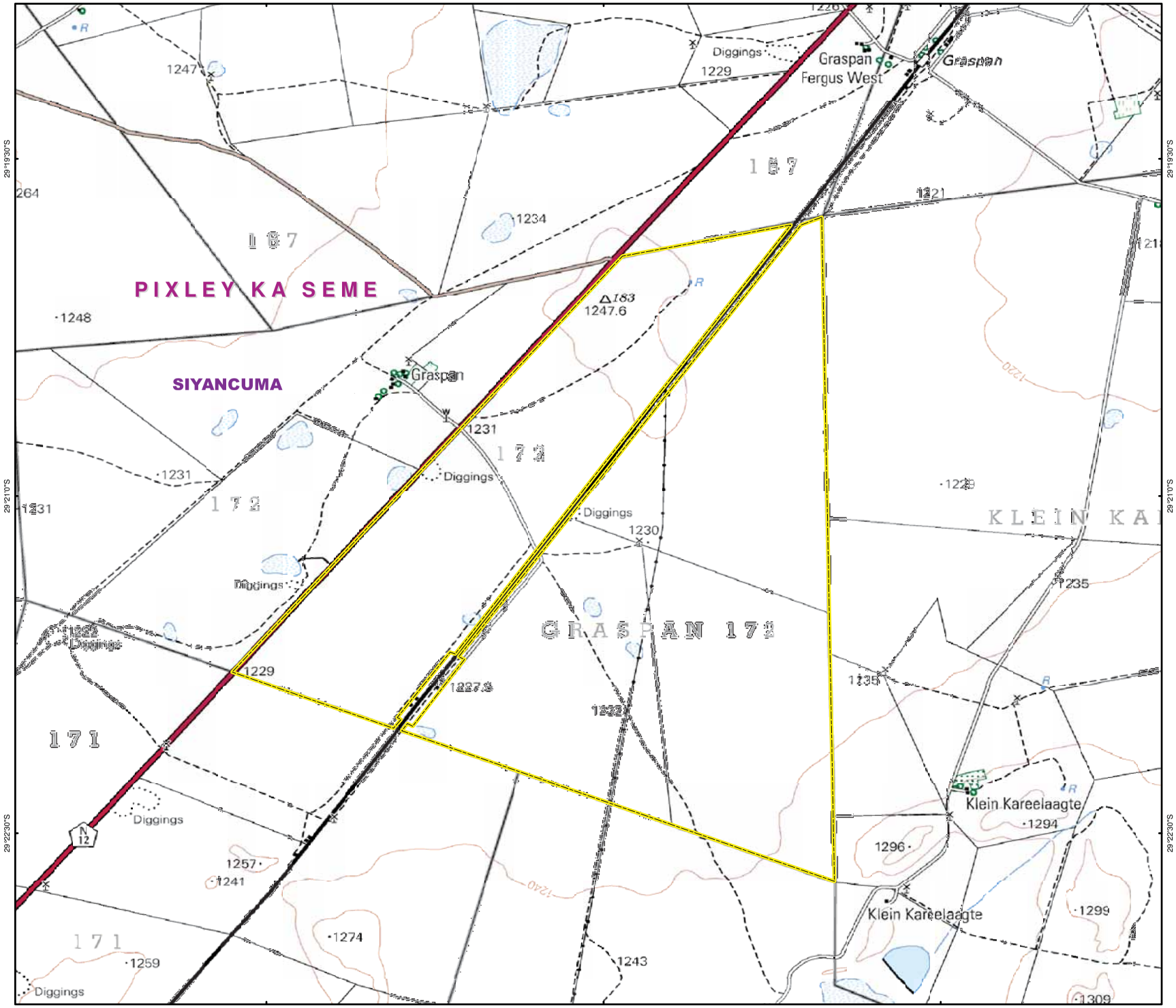
specifically, the solar energy sector rapidly develops, increasing potential opportunities available to such individuals.

4.2 PROJECT LOCATION AND EXISTING LAND USE

The proposed PV power facility is located on the remaining extent of Farm Graspan (No. 172), situated in the Siyancuma Local Municipality in the Northern Cape (see *Figure 4.2*). The site is located approximately 40km north east of Hopetown and is accessible from the N12 (tarred road).

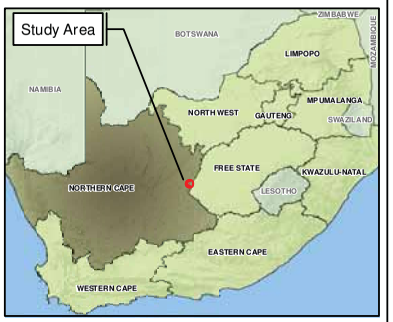
The site is designated for agricultural use, with current agricultural practices including sheep and cattle farming. Land use in the surrounding area includes further sheep and cattle farming, cultivation approximately 15km to the east and 30km to the north east of the site, and various salt works within a 15km radius of the site.

There is an existing railway line traversing the site in a north east direction. An existing gravel road network exists on the site, which crosses the railway line. The existing 132kV Graspan Traction Substation is located within the northern section of the site, and an existing 132kV power line traverses the site from the Graspan Traction Substation in a north south direction, exiting the southern boundary of the site.



Legend

- Graspan Photovoltaic (PV) Power Facility
- Windpump
- Contours
- Rivers
- Cadastral Farms
- Power Line
- Main Roads
- Secondary Roads
- Other Roads
- Track and Hiking Trail
- Railway
- Water Bodies
- Non-Perrenial Water



SCALE:

0 500 1000 1500

Metres

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TITLE:

Figure 4.2: Location of Graspan PV Power Facility on the Topographical Map

CLIENT:

solairedirect
Southern Africa
The solar MWh company

DATE: Mar 2012	CHECKED: DA	PROJECT: 0156408
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 30 000

DRAWING: Graspan Topo Map.mxd

REV: 0

ERM
Block A, Silverwood House
Silverwood Close
Steenberg Office Park, 7945
Cape Town, SOUTH AFRICA
Tel: +27 (0)21 702 9100
Fax +27 (0)21 701 7900

Projection: Geographic: WGS84
Source: Chief Directorate National Geo-Spatial Information - 2924AD_2005_ED3_GEO.TIF
Inset Map: Esri Data & Maps

SIZE: A3

T:\Gis Projects\0156408_Solaire_Direct\Mapping\MXD\Graspan\Graspan Topo Map.mxd

4.3 *PV PLANTS AND POWER GENERATION*

Solar energy systems produce energy by converting solar irradiation into electricity or heat. For the proposed PV power facility, Solaire Direct will utilise photovoltaic (PV) technology to generate electricity. PV technology consists of the following components:

- **PV cell;** a basic photovoltaic device, which generates electricity when exposed to solar radiation. The absorbed solar energy excites electrons inside the cells and produces electrical energy. The PV cells are commonly constructed from polycrystalline silicon. All photovoltaic cells produce direct current (DC).

- **PV module or panel;** the smallest complete assembly of interconnected photovoltaic cells. In the case of crystalline silicon cells - following testing and sorting to match the current and voltage, the cells are interconnected and encapsulated between a transparent front (usually glass) and a backing material. The module is then typically mounted in an aluminium frame.

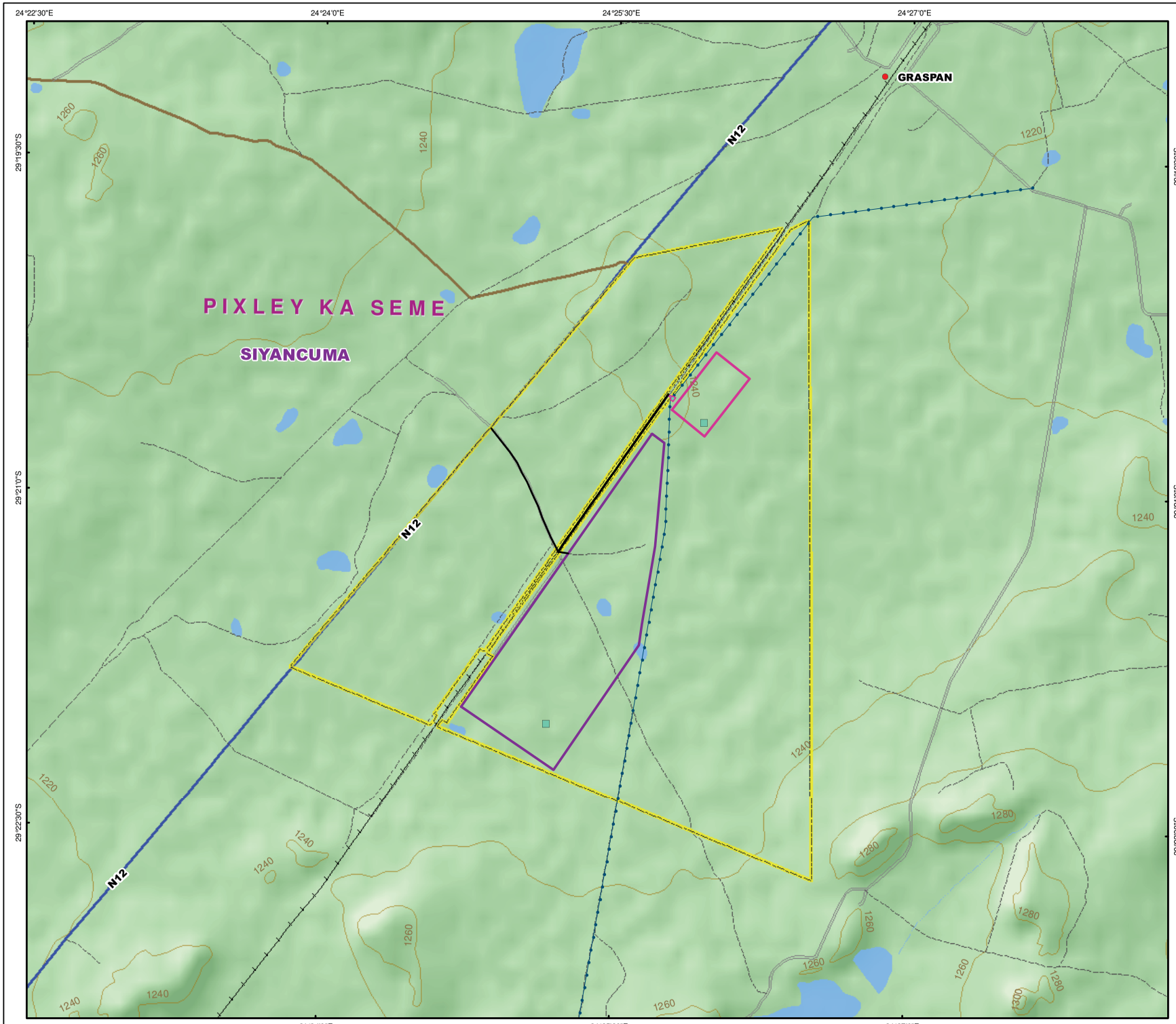
- **PV array;** a mechanically integrated assembly of modules and panels together with support structure to form a direct current power producing unit. The proposed PV power facility will consist of antireflective modules arranged in numerous arrays. The feeding of electricity into the grid requires the transformation of DC from the PV array into alternating current (AC) by an inverter.

4.4 *PROJECT COMPONENTS*

It is anticipated that the project will feed a total of 90MWs into the national grid. The key components of the proposed PV power plant are discussed in detail below:

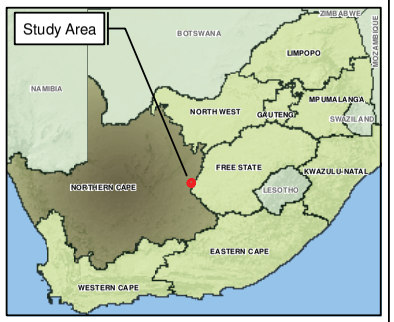
- PV solar panels/modules (arranged in arrays);
- PV module mountings;
- DC-AC current inverters and transformers;
- New grid connection substation;
- Underground cabling/ overhead power lines;
- On-site buildings (including an operational control centre, office, ablutions and a guard house);
- Access roads and internal road network; and
- Ancillary infrastructure.

An indicative site layout has been developed and this is shown in *Figure 4.3*. This is subject to change through the EIA process based on environmental and technical constraints.



Legend

- Graspan Photovoltaic (PV) Power Facility
- Town
- Contours
- Non-Perennial River
- Water Bodies
- National Route
- Secondary Road
- Other Access
- Track/Footpath
- Access Road
- Railway Line
- Existing Overhead Transmission Line ESKOM
- Substation ESKOM
- Proposed Substations
- Proposed 10MW Alternative 2
- 80MW Alternative Site Layout



0 500 1000 1500
Meters

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TITLE:

Figure 4.3: Site Layout Map

CLIENT:

solairedirect
Southern Africa
The solar MWh company

DATE: Mar 2012	CHECKED: DA	PROJECT: 0156408
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 30 000

DRAWING: Graspan Site Layout Map.mxd

REV: 0

ERM
Block A, Silverwood House
Silverwood Close
Steenberg Office Park, 7945
Cape Town, SOUTH AFRICA
Tel: +27 (0)21 702 9100
Fax +27 (0)21 701 7900

Projection: Geographic: WGS84
Source: Chief Directorate National Geo-Spatial Information - Base Data Simon Todd - Ecological Sensitivity
Inset Map: Esri Data & Maps

SIZE: A3

T:\Gis Projects\0156408_Solaire_Direct\Mapping\MXD\Graspan\Graspan Site Layout Map.mxd

4.4.1 PV Arrays and Mountings

The proposed development will include PV panels that will occupy approximately 150ha (1.5km^2) of the site area in total. The footprint of PV arrays will be approximately 127ha. The PV panels will be 1660mm in length, 990mm in width and 45mm in height with each producing an output of 250W. Each PV panel will weigh approximately 19kg. Within each PV panel there will be 60 polycrystalline cells (each 156 mm x 156mm). These polycrystalline cells will be encapsulated in Ethylene Vinyle Acetate (EVA). The front substrate of the PV panel will be 3.2mm of antireflection glass, while the back substrate will be Tedlar or APA composite sheeting. Each PV panel will be placed in a black or raw anodized aluminium frame 45mm in width and equipped with drainage holes. PV panels will be connected in arrays to form units with a total power of 1MW each (around 249500 PV panels will be installed on a 90MW project). See *Annex F* for further technical specifications of the PV panels.

The PV panels will be mounted on aluminium fixed frame structures approximately 3.33m in height from the ground (see *Figure 4.4*). The aluminium structures will be mounted on steel screw piles or concrete foundations 1500mm deep, depending on soil conditions. The distance or spacing between rows will be approximately 6.2m. The PV arrays will face north in order to capture maximum sunlight. *Figure 4.5* shows a typical array of PV panels.

Figure 4.4 Typical Anodized Aluminium Frame

Source: Solaire Direct, 2012

Figure 4.5 Typical PV Array

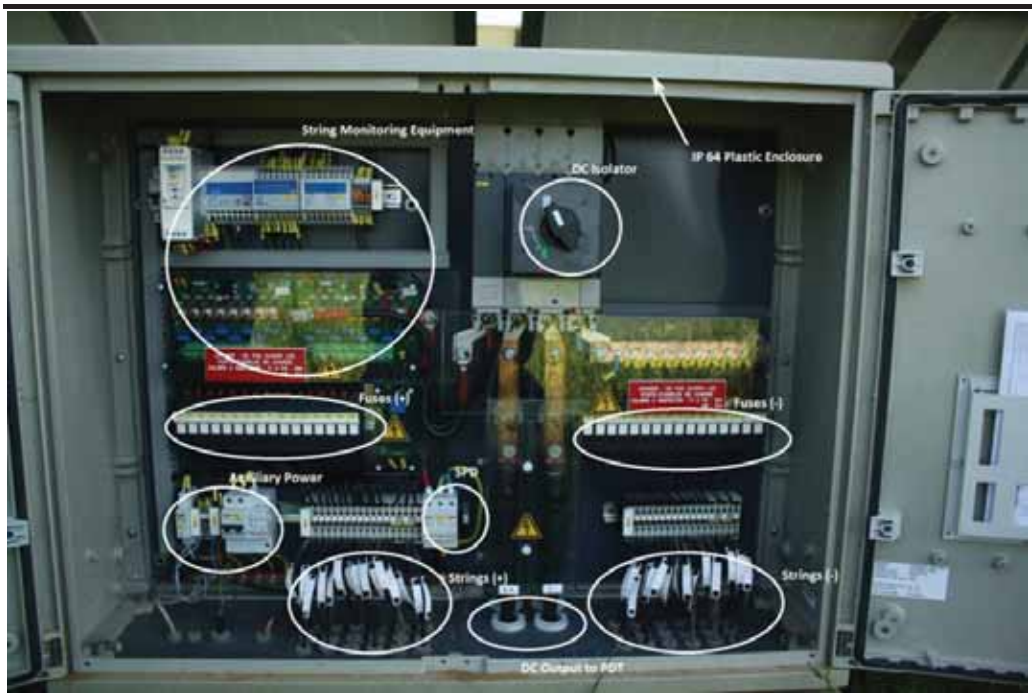
4.4.2 *Electrical Connections and Controls*

The PV panel arrays will be connected via underground cables (800mm depth) to array enclosures (see *Figure 4.6* and *Figure 4.7*). Array enclosures combine the power generated by many PV panels and transmit that power via two underground DC cables (the array enclosures will be mounted underneath the PV module mounting structures and each array enclosure will occupy an area of approximately $1m^2$) to an inverter/transformer enclosure.

Figure 4.6 Typical Array Enclosure

Source: Solaire Direct, 2012

Figure 4.7 Array Enclosure Components



Source: Solaire Direct, 2012

The inverter/transformer enclosures convert the direct current (DC) produced by the PV panels to alternating current (AC) (see *Figure 4.8*). The inverter/transformer enclosures also contain transformers that transform low voltage AC (350V) from the inverter to medium voltage AC (22kV). The rated power of each central inverter is 630kW at peak output. Two central inverters,

along with an LV AC to MV AC step-up transformer is placed inside a pre-fabricated concrete container. The container size is approximately 7m x 3m x 3.5m (length x width x height). Between 57 and 60 inverter/transformer enclosures will be required. The inverter/transformer enclosures will connect via underground cabling (depth 800mm) to a new grid connection substation of approximately 400m². The new grid connection substation will be a brick building containing medium voltage (22kV) circuit breakers that will combine the power generated by each inverter/transformer enclosure. This combined power will then be transformed from medium voltage (22kV) up to high voltage (132kV) for connection to the existing Eskom Graspan Traction Substation by power transformers. The power transformer units will be two 40MW power transformers or three 25MW power transformers. The power transformers and associated protection equipment (circuit breakers, etc) will be installed in the new grid connection substation yard, constructed to Eskom specifications (see *Figure 4.9* and *Figure 4.10*).

Figure 4.8 Typical Inverter/Transformer Enclosures

Source: Solaire Direct, 2012

Figure 4.9 Power Transformer

Source: Solaire Direct, 2012

Figure 4.10 Transformer in Grid Connection Substation Yard

Source: Solaire Direct, 2012

4.4.3 Grid Connection

The 132kV power from the new grid connection substation will be connected to the existing Eskom Graspan Traction Substation, located in the northern part of the site on the east side of the railway line, by two overhead power lines of approximately 800 m in length (see *Figure 4.11*). Both power lines will be installed on the same steel lattice structure, according to Eskom specifications.

Figure 4.11 Existing Graspan Traction Substation

4.4.4 *Auxiliary Electrical Equipment*

The following additional electrical equipment will be required for the project:

- A 200kVA (10MW) diesel generator will supply power to security and monitoring systems in the event of a grid failure;
- Security system, electrical fence and 24 hour on site security access control;
- Fire detection system;
- Weather monitoring equipment (rainfall, wind speed/direction, solar irradiation, air moisture) will be located inside the guard house;
- PV power facility monitoring equipment and associated telecommunication links will be located inside the guard house; and
- Airconditioning equipment inside inverter/transformer enclosures which will regulate the operating temperature of the inverters.

4.4.5 *Access Roads and Internal Paths*

The site will be accessed from the N12 national road at the existing site entrance (29^{0}20'42.59" S 24^{0}24'51.66"E). An existing gravel road will upgraded to approximately 6m in width and used to cross the western portion of the site to the railway line. The railway line crossing will be upgraded to decrease the

slope to between 26-45 degrees and 5m width on either side of the railway line. The existing gravel road on the east side of the railway line running north will be used and upgraded to approximately 6m in width in order to reach the PV power facility's direct footprint. Internal paths will be created to enable access within the PV power facility.

Within the PV arrays, a minimum spacing of 6.2m is required between each row to avoid shadowing of the panels by adjacent rows. These spaces will not be gravelled or paved. PV power facility maintenance will consist mainly of PV panel replacement, PV panel cleaning and other minor mechanical and electrical infrastructure repairs. Access will be needed primarily for light service vehicles entering the site for maintenance, inspection and PV panel cleaning purposes. During the operational phase, traffic impacts will be less, with vehicles only required to transport infrastructure during routine maintenance and upgrading phases.

4.4.6 Additional Infrastructure

Additional infrastructure that will be required for the project includes the following:

- site perimeter fencing (electrical palisade fencing of approximately 2.8m in height) including access gates;
- lighting at the main entrance only;
- temporary construction camp of approximately 4,800m² (to house 35 personnel);
- an office for project supervision;
- a meeting room;
- an office for the caretaker of the site;
- two cloakrooms;
- two chemical toilets, as there is no water on the site; and
- a lay-down area for the temporary storage of materials during the construction activities of approximately 4,800m².

At this stage it is unknown and unlikely if a borrow pit for rock or soil material will be required for the construction of project infrastructure. A soil stockpile of approximately 6,000m² will be required.

4.5 TRANSPORT, EQUIPMENT AND MACHINERY REQUIREMENTS

During the construction phase, it is expected that potential traffic impacts will be higher than normal as trucks will be required to transport materials and equipment (PV panels, frames etc) to the site. Infrastructure required for the proposed PV power facility, including support structures, PV modules, frames, as well as machinery will be transported to and from the site from various locations in the region.

It is anticipated that the following number of trips would be required:

- Delivery of panels: 200 loads consisting of 18.9 tons each on 12m long trailers.
- Delivery of electrical equipment and components: 28 loads of 20 tons each.
- Delivery of frames: 21 loads of 20 tons each.
- Earthworks: potentially 1400 loads of $10m^3$ each to the identified Local Authority Landfill Site.

During the operational phase, it is expected that potential traffic impacts will be less, with vehicles only required to transport infrastructure during routine maintenance and upgrading phases.

4.6 WATER REQUIREMENTS

During the construction phase the primary water use requirement will be for dust control. However, water may also be required to moisture condition the soils for proper compaction at roads and foundations. It is estimated that for dust control and compaction approximately 4,800,000 litres of water will be required (an average of three truck loads per day for the first 60 days of construction and one truck load per day for the following 60 days of construction, with each truck carrying approximately 20,000 litres). Water will also be required for the concrete foundations. It is estimated that 575,586 litres of water will be required for the concrete foundations (with a total of 209 litres/m^3 X 2,754m^3). The estimated construction-related water requirement is 5.4 million litres with a daily usage of 60,000 kilolitres. Temporary ablution facilities will be required during construction. Water requirements for the construction phase of the PV power facility will be supplied by the Local Water Users' Association alternatively water will be provided via a rainwater tank.

During the operational phase it is estimated that PV panel cleaning will require a total of approximately 100,000 litres/year (10,000 litres/MW/year). The PV panels will be cleaned manually with a window washer type device such (covered with a specialized cloth material), soft brush, window squeegee or soft cloth. A composting toilet will be installed in the guard house requiring no water. During the operational phase drinking water and process water will also be supplied by existing boreholes and may require treatment for domestic use.

During the operational phase it is the intention of Solaire Direct to source the required water from an existing reticulation system, either from the local municipality or the landowner. If this is not feasible, alternative options

would be to tanker in the required water and / or amend the existing landowner's water use license to include the activity of the required water use.

During decommissioning and site restoration dust control will be required, and it is anticipated that similar volumes of water as the construction phase will be required. Similar temporary ablution facilities as in the construction phase will be required during the decommissioning phase.

4.7 WASTE MANAGEMENT

All project generated wastes will need to be managed and disposed of in a manner to prevent potential impacts on the environment and risks to human health. A Waste Management Plan (WMP) for the proposed project will be developed. This will follow the principles of waste minimisation at source, segregation for reuse, recycling, treatment or disposal.

All wastes produced from the project activities on site will be temporarily stored in designated waste storage areas. Waste steams will be generated from logistical activities associated with project activities and accommodating personnel.

4.7.1 Waste Types and Quantities Generated

All wastes generated from the project will be categorised as either *non-hazardous* or *hazardous* following an assessment of the hazard potentials of the material in line with South African requirements. The main sources of waste will result from the temporary construction camp and construction and decommissioning activities. One of the main sources of non-hazardous wastes will be the domestic type solid waste from the approximately 35 personnel at the temporary construction camp. These wastes will be produced daily and comprise of the following:

- Domestic type waste, such as mixed waste from kitchens/canteen or living quarters;
    - residual packaging and food wastes
    - metal cans (from food and drinks)
    - plastics drinks bottles
    - glass jars and bottles
- Wooden pallets and cartons;
- Scrap metal;
- Concrete waste;
- Paper and cardboard;
- Grey water - from showers; and
- Food wastes.

The following hazardous wastes will also be produced from construction activities.

- Batteries (including large lead acid type)
- Medical/clinical wastes - from camp clinic
- Oily rags and absorbents
- Used oil and oil filters - from generators or vehicle maintenance
- Contaminated water - slops and oily water from drip trays
- Sewage from toilets

All wastes produced from project activities on site will be transferred to designated temporary storage areas and where possible into secure containers. Solid wastes will be segregated to facilitate reuse and recycling of specific materials. All wastes that cannot be reused or recycled will be collected by approved waste contractors and transferred to an appropriately licensed waste management facility for treatment and disposal.

4.7.2 Hazardous Materials and Hazardous Wastes

The construction and decommissioning phases will require the use of hazardous materials such as fuels and greases to fuel equipment and vehicles and maintain equipment. These substances will be stored on site in temporary aboveground storage tanks. Fuels on site will be stored in a locked container within a fenced and secure temporary staging area. Trucks and construction vehicles will be serviced off site. The use, storage, transport and disposal of hazardous materials used for the project will be carried out in accordance with all applicable South African regulations. Material Safety Data Sheets for all applicable materials present on site will be readily available to on site personnel. It is proposed that the construction contracting company supply the required temporary ablution facilities and be responsible for the removal and treatment thereof. Solaire Direct will be responsible to ensure that the contracting company is accredited and has the necessary permits to remove the sewage. The sewage will be treated in accordance with the municipal sewage works policies and guidelines.

Operations and maintenance of the PV power plant is not expected to require hazardous materials to be present and used on site or to generate hazardous waste. PV panels, array enclosures and inverter/transformer enclosures will not produce waste during operation.

The necessary associated sewage services already exist on the site and no additional sewage services infrastructure will be required on the property, e.g. sewage treatment. The composting toilet to be used in the guardhouse makes use of an aerobic process to treat human waste material. The composting toilet requires no water and produces compost-like, odourless, de-hydrated material that could be either disposed of via municipal waste services or be used in the production of compost.

4.7.3 Non-hazardous Wastes

Construction waste will most likely consist of concrete (if concrete foundations are utilised to support mounting structures) mixed with scrap metal. All concrete mixing be undertaken on impermeable plastic lining to prevent contamination of the soils and surrounding areas. Construction solid waste will be managed by a Construction Environmental Management Plan (EMP) and will incorporate reduction, recycling and re-use principles.

All waste that cannot be reused or recycled will be appropriately disposed of. All construction debris will be placed in appropriate on site storage containers and periodically disposed of by a licensed waste contractor in accordance with applicable South African regulations. The construction contractor will remove refuse collected from the designated waste storage areas at the site at least once a week. All rubble generated during the construction phase will be removed from the site regularly to a licensed landfill site. It is estimated that approximately 222m^3 of construction debris will be produced per month, while it is estimated that approximately 0.2m^3 of solid waste will be generated during the operational phase.

4.8 SOCIO-ECONOMIC ASPECTS

The total investment cost of the project is estimated to be approximately R 250 million.

During the construction phase the following employment opportunities will be created:

- Site management: 22 employees;
- Civil works: 27 employees;
- Frames & foundations: 18 employees;
- PV modules: 93 employees; and
- Electrical system & components: 44 employees.

Of the PV power facility's employees during construction, 93 employees are estimated to be skilled.

During the operations phase the following employment opportunities will be created:

- General administration and maintenance: 8 employees;
- Compliance related activities: 3 employees;
- Performance monitoring of the PV power facility: 1 employee; and
- Security: 12 employees.

Of the PV power facility's employees during construction, 21 employees are estimated to be skilled.

Certain aspects of the project will provide better opportunities for local employment and economic development than others. The conditions of contract between Solaire Direct and the subcontractor will include requirements for local Enterprise Development addressing the following identified opportunities:

- Electrical system: there will be a requirement for the electrical contractor to make use of local electrical companies for certain elements of the installation of the electrical system. The requirement will be for a minimum of 5 percent of the subcontract value to be spent on local enterprises.

- Security: there will be a contractual requirement for the security service contractor to subcontract the provision of local security staff to a local company. If such a company does not exist, then the requirement will be for the security service contractor to establish such a subcontractor. The requirement will be for a minimum of 25 percent of the subcontract value to be spent on local enterprises.

The labour contract between Solaire Direct and contractors who are appointed to provide services during the construction phase of the development will specify local labour employment criteria, e.g. percentage of total workforce.

The labour cost estimate during construction is estimated to be R 3 million, of which local labour is expected to receive 75 percent (approximately R 2.25 million). This estimate excludes the value of manufacturing labour costs. The estimate of the local manufacturing portion of the EPC contract is approximately R 18 million.

Numerous local employment opportunities will be created in the manufacturing process of the PV panels, steel frames, etc. During the operation phase, the PV power plant is expected to generate approximately 8- 10 security and 4-6 operation and maintenance employment opportunities (totalling an estimated R 1.14 million per year). On-going reporting regarding these specifics to the PSC is required.

All financial benefits will accrue to beneficiaries, including equity partners, according to Solaire Direct's company structure. Solaire Direct intends to contribute a portion of the gross profit (before tax and depending on the project stage) to a local community trust that has been set up specifically for this project. The value of this contribution will be determined on finalisation of the tariff as part of the Power Purchase Agreement (PPA).

4.9 PROJECT STAGES AND ACTIVITIES

The project life-cycle can be divided into three key stages as follows:

- site preparation and construction;

- operation (including maintenance and repair); and
- decommissioning.

Each of these stages is outlined in the sections below.

4.9.1 Site Preparation and Construction

Prior to construction of the PV power plant, the site would be prepared. The 150ha site is generally flat. Site preparation activities would include the following activities:

- vegetation clearance – removal or cutting of any tall vegetation if present (bush cutting);
- levelling and grading of areas where the array will be sited to remove steep slopes and undulations would normally occur but this is not deemed necessary given the flat nature of the terrain on the site ;
- levelling of hard-standing areas e.g. for temporary laydown and storage areas;
- erection of site fencing;
- construction of a temporary construction camp; and
- upgrading of farm tracks/ construction of on-site access roads.

Once the site has been prepared, prior to the installation of the PV components, the following construction activities will take place:

- the installation of fixed aluminium structures to support the PV modules;
- the construction of the new grid connection substation;
- the construction of electrical and control room;
- the construction of site office and storage facilities, including security and ablution facilities and associated septic tanks;
- the construction of array enclosure and inverter/transformer foundations and housing; and
- the installation of cables.

The PV, electrical and structure equipment will be procured in South Africa where available, or from an international manufacturer when sourcing from within the country is not possible. It is expected that these components will be delivered to site via road in small trucks. Once the PV components have arrived on site, technicians will supervise the assembly of the panels and test the facility. The PV panels will be installed on the fixed aluminium structures anchored to the ground through poles which will be screwed or piled into the ground.

Phased Approach to Construction

The development will be constructed in a phased approach. The exact size of each phase will be dependant on the various consents and authorisations to be obtained for the project, primarily the Power Purchase Agreement, as well as the interconnection technical constraints to be discussed and agreed with

Eskom in the Interconnection Agreement. Installation of the full 90MW could take up to 9 months or more to complete.

During the site preparation period, the workforce required for site security, manual labour, civil works, transportation of goods and other similar services will most likely be drawn from the local labour pool. During the first phase of construction, a highly-skilled team of solar energy technicians (the majority of which would likely be from overseas as a workforce with the required skills is not currently available in the South African market) will train a number of the potential employees preferably from the province, where available. Up to 204 personnel will be required to construct the full 90MW PV power facility, however, any accurate employment number is dependent on how the phasing of the project is undertaken. For the purposes of the impact assessment we have assumed that the development will take place in consecutive phases rather than all at once.

4.9.2 Operation

Once each phase of the facility is complete and operational it is expected that it will have a lifespan of at least 20 years. Measuring the performance of the PV power plant will be done remotely, through the use of a monitoring system. Day to day facility operations will involve both regular on site preventive and corrective maintenance tasks in order to keep the PV power plant in optimal working order throughout the operational period. Maintenance will consist mostly of panel replacement and other mechanical and electrical infrastructure repairs. Intermittent cleaning of the panels will be carried out as necessary which is anticipated to be once or twice a year. Faulty components will be replaced as soon as problems are identified.

4.9.3 Decommissioning

The PV power facility will be decommissioned after 20-30 years, alternatively it will be upgraded or an application submitted to obtain a new license. Solaire Direct intend for the salvage value to cover the cost of decommissioning. Should the plant be decommissioned, the site will be rehabilitated to its original state:

- PV panels will be removed from the fixed aluminium frames.
- Fixed aluminium frame structures will be removed.
- PV panels will be transported to special recycling facilities (alternatively used at other operational sites).
- Electrical equipment (transformers) will either be re-used on other developments/projects or sold.
- Underground cable runs (where applicable) will be removed.

- Gravel/chipstone on the access roads, onsite service roads, guardhouse foundations will be removed.

- Buildings, such as the guardhouse can be taken over by the landowner for operational purposes, alternately all the reusable material can be removed, the shells demolished and the rubble transported to a municipal waste site.

- Disturbed land areas will be rehabilitated, and replanted with indigenous vegetation if required.

The environment consists of interacting geological, biological, social, economic and cultural factors. It is essential that the effects of any proposed development on all aspects of the environment be assessed before a decision to proceed is taken. The environmental and social baseline conditions of the study area for this EIA are described briefly in this section. This description is based on a combination of desk-top research, analysis of maps and aerial photography and an initial site inspection. Further specialist studies will explore issues such as vegetation, visual, heritage resources and socio-economic considerations during the next phase of the EIA. The findings of these studies will inform the assessment of the impacts that the proposed development may have on these environmental and social aspects.

5.1 BIOPHYSICAL BASELINE

This section provides an overview of the biophysical components of the receiving environment.

5.1.1 Climate

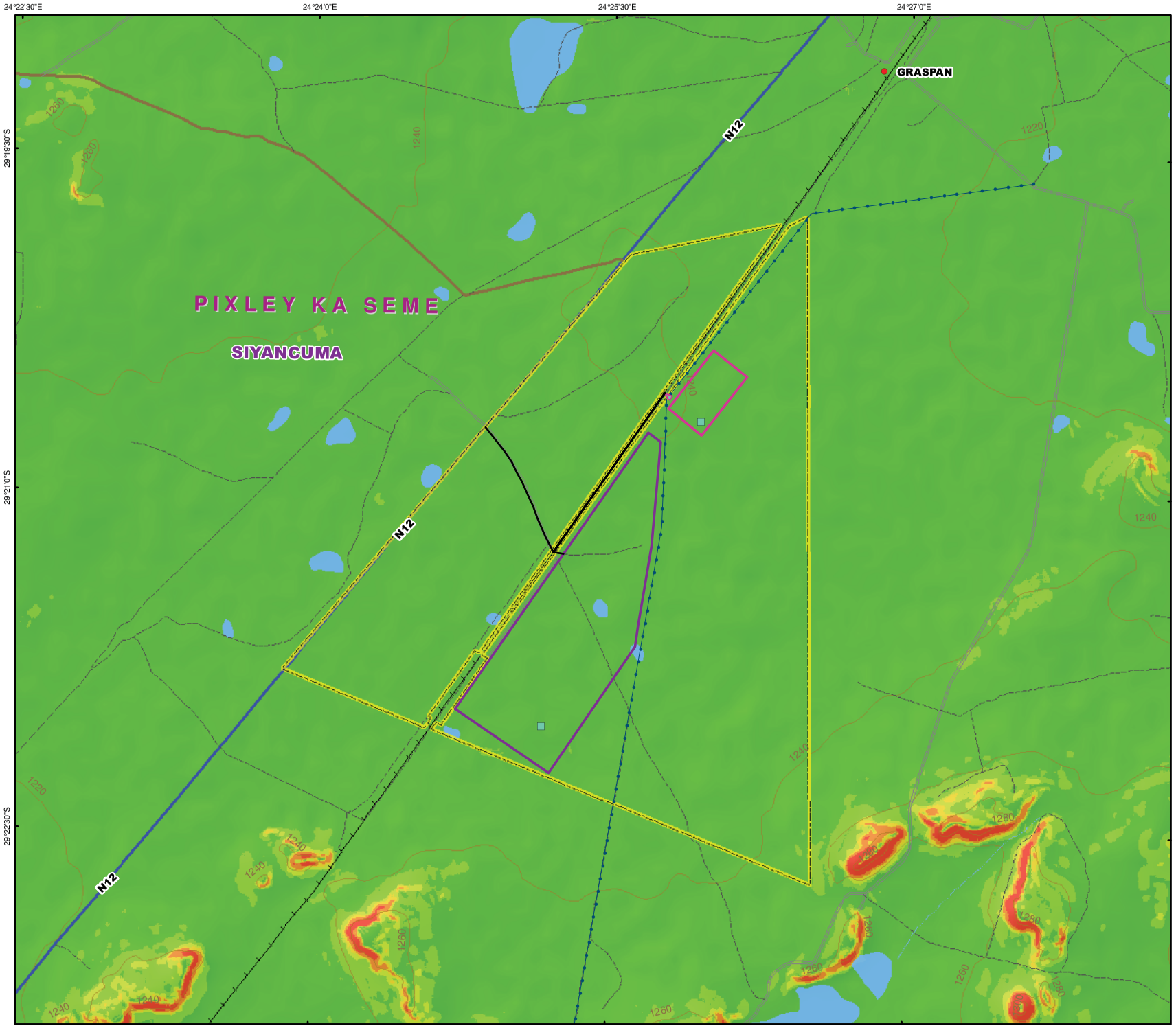
The study area has a semi-arid, continental climate with a late summer rainfall regime i.e. most of the rainfall is confined to mid and late summer. The rainfall data for the study area was sourced from the Rainfall Atlas for South Africa. According to this database the Mean Annual Precipitation (MAP) for the project area is approximately 311mm per year with 77 percent of this falling between November and April. The region typically experiences hot days with an average midday temperature of 32°C in January, while average night time temperatures drop to around 1°C during June and July (1) . The mean relative humidity for an average year is 30.8 percent, while on a monthly basis it ranges from 23 percent in September to 39 percent in April. There is an average range of sunshine hours between 8.6 hours/day in March and 10.5 hours/day in December. Overall there are approximately 3495 sunshine hours annually in the area (2).

5.1.2 Landscape and Topography

The topography of the area and proposed PV site are characterised by a flat and gently sloping topography with an average gradient of less than 10percent (*Figure 5.1*). The terrain slopes up towards dolerite hills (referred to as 'koppies') around Klein Kareelaagte to the southeast of the project site. The site is located in the Nama-Karoo Biome. According to the national vegetation map (Mucina & Rutherford 2006), the site is overwhelmingly dominated by Northern Upper Karoo vegetation, with a small portion of Kimberley

(1) http://www.saexplorer.co.za/south-africa/climate/cradock_climate.asp
(2) http://www.climatetemp.info/south-africa/kimberley.html Accessed 27 March 2012.

Thornveld in the south eastern corner of the site. However, in reality, there are also several small pans at the site which correspond to the Highveld Salt Pans vegetation types, and a section of rocky outcrop which is considered to be Vaalbos Rocky Shrubland. The extent of Kimberley Thornveld is significantly more extensive than the national vegetation map suggests. All four vegetation types are all classified as Least Threatened.



Legend

- Graspan Photovoltaic (PV) Power Facility
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- Contours
- Non-Perennial River
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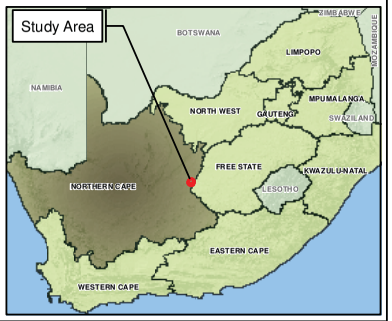
- Other Access
- Track/Footpath
- Access Road
- Railway Line
- Existing Overhead Transmission Line ESKOM

Slope (Degrees)

- < 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 12
- > 12



0 500 1000 1500
Meters

N

TITLE:

Figure 5.1: Slope Map

CLIENT:

solairedirect
Southern Africa
The solar MWh company

DATE: Mar 2012	CHECKED: DA	PROJECT: 0156408
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 30 000

DRAWING: Graspan Slope Map.mxd

REV: 0

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Fax +27 (0)21 701 7900

Projection: Geographic: WGS84
Source: Chief Directorate National Geo-Spatial Information - Base Data
Inset Map: Esri Data & Maps

SIZE: A3

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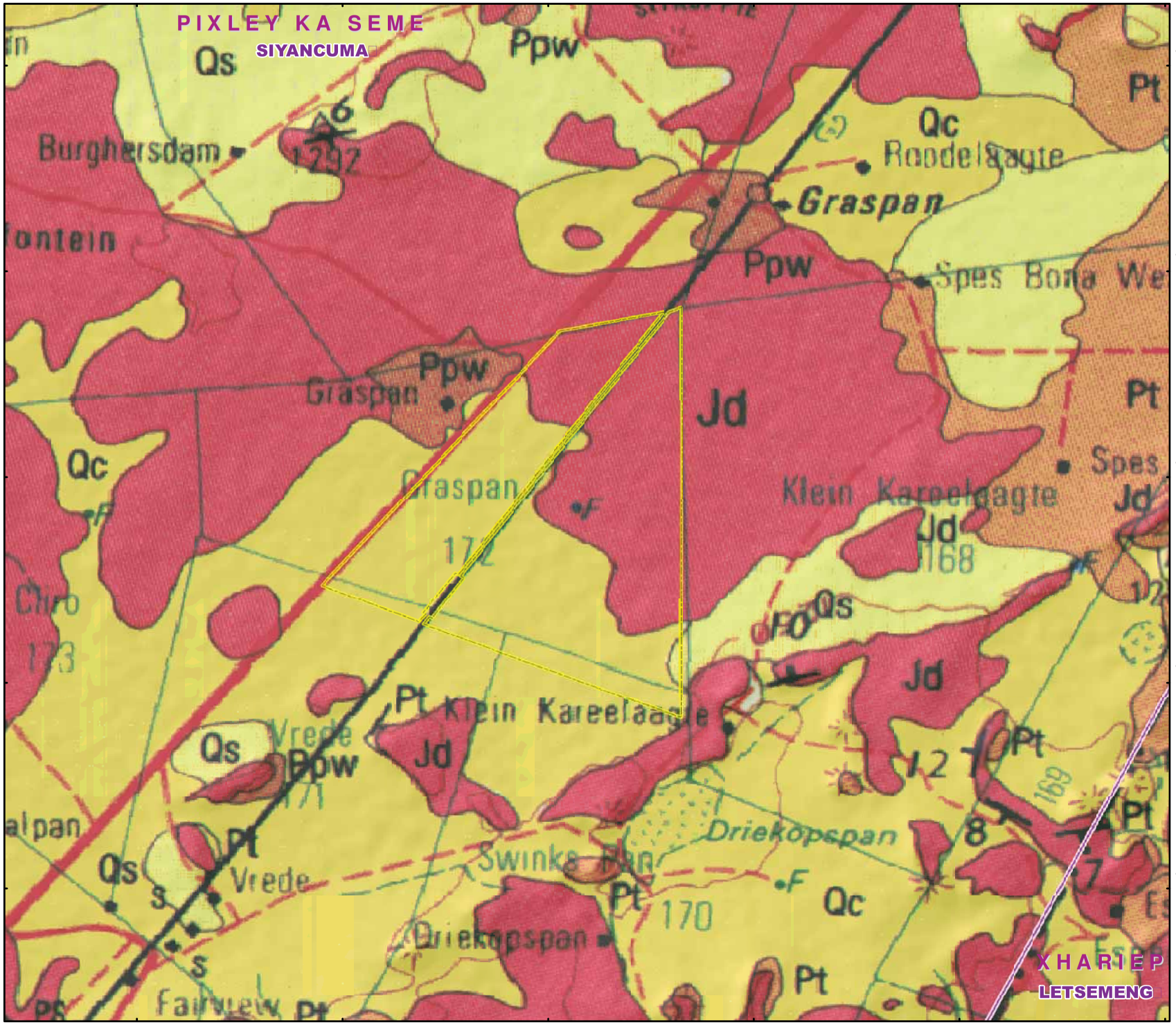
Figure 5.2 Flat Plains of the Graspan Site

5.1.3 Geology and Soils

The geology of the farm is underlain by two primary geological materials, namely shale and tillite (see *Figure 5.3*). Shale, a clastic sedimentary rock, underlies the southern and western portions of the site. Tillite, consisting of consolidated masses of unweathered blocks, is found to the northern and eastern parts of the site. The entire site is underlain by red apedal soil types. Apedal soils lack well formed peds [(1)], other than porous micro-aggregates, and are weakly structured. Apedal soils tend to be freely drained, and the red colour generally signifies aeration in the upper solum. The entire study area is classified as having an effective soil depth (depth to which roots can penetrate the soil) of less than 0.4m deep, which is a limiting factor in terms of sustainable crop production. The soils on site are associated with low organic matter levels and a neutral pH.

(1) A ped is an individual natural soil aggregate (Soil Classification Working Group, 1991).

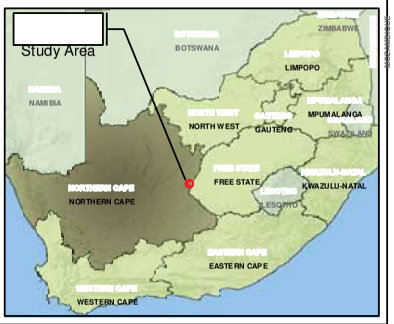


Legend

- Graspan PV Power Facility
- District Municipalities
- Local Municipalities
- Road
- Railway
- River
- Cadastral Farm

Geology

- Qc Calcrete, calcified, pandune and surface limestone
- Qs Sand: Red and grey aeolian dune sand
- Qa Alluvial diamondiferous gravel
- Pt Shale, siltstone, sandstone
- Jd Dolerite



SCALE: 0 0.5 1 1.5 2 2.5 Kilometres

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TITLE:

Figure 5.3: Geology of the Graspan Site and Surrounding Area

CLIENT: solairedirect Southern Africa The solar MWh company

DATE: Feb 2012	CHECKED: LB	PROJECT: 0156408
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 50 000

DRAWING: Graspan Geology Map.mxd | REV: 0

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Projection: Geographic: WGS84
Source: Coucil for Geoscience - 2924 Geology Map
Inset Map: Esri Data & Maps

SIZE: A3

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5.1.4 *Hydrology- Surface Water and Ground Water*

The area has aquifer classification of minor, i.e. a moderately yielding aquifer system of variable water quality. The dissolved solids (mg/L) are between 301-500mg, and the borehole distribution for the area is between 6-10.

There are a number of pans in the area but no major rivers or water courses are present the surrounding landscape. Just south of the site there is a small non-perennial river feeding into a dam at Klein Kareelaagte.

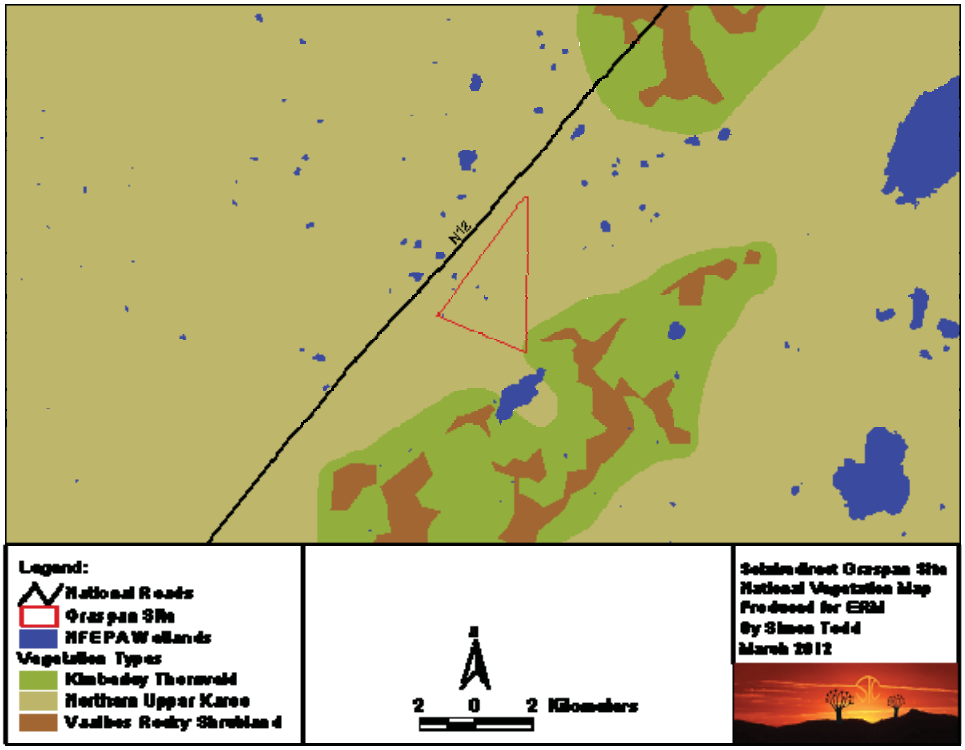
Apart from the pans there were no other drainage or mesic habitats present at the site. The site is largely very flat and combined with the low rainfall, drainage lines have not developed. During the site visit, six small pans were identified and mapped, of these, three have also been identified and mapped by the Freshwater Ecosystem Priority Areas (FEPAs) assessment produced by the CSIR (Nel et al., 2011). The pans identified under the FEPA, were however given a rank of 4 indicating that they wetlands which are perceived to be in good condition and which occur in proximity to other such wetlands, but have not been identified by experts as priority wetlands.

5.1.5 *Flora and Fauna*

Vegetation

According to the national vegetation map (Mucina & Rutherford, 2006), the site is overwhelmingly dominated by Northern Upper Karoo, with a small portion of Kimberley Thornveld in the south eastern corner of the site. However, in reality, there are also several small pans at the site which correspond to the Highveld Salt Pans vegetation types, and a section of rocky outcrop which is considered to be Vaalbos Rocky Shrubland. The extent of Kimberley Thornveld, although not very large is significantly more extensive than the national vegetation map suggests. All four vegetation types have not been heavily impacted by intensive agriculture or mining and are all classified as Least Threatened. Within the context of the site, the Vaalbos Rocky Shrubland unit is deemed the most sensitive as it is associated with the rocky outcrops and represents habitat not found elsewhere on the site. The Kimberley Thornveld unit is deemed, at a broad-scale to be more sensitive than the Northern Upper Karoo, because those areas dominated by Kimberley Thornveld contains numerous large trees, while the Northern Upper Karoo is much more open and dominated by low bushes and grasses. *Figure 5.4* shows the broad-scale vegetation types of the Graspan site and surrounds. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes wetlands delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011). The wetlands correspond to the Highveld Salt Pans vegetation type of Mucina & Rutherford (2006).

Figure 5.4 Broad-scale Vegetation Types



Source: Simon Todd, 2012.

Within the site, as many as 13 different plant communities could be identified, which were associated with different habitats and soil substrates. The most significant of which are as follows (see *Figure 5.5*):

- *Eragrostis lehmanniana* Grassland – occurs on the coarse sands of the site, particularly in the south-east. Other common species in this vegetation unit include *Stipagrostis ciliata*, *Plinthus karooicus*, *Asparagus capensis* and *Senna italica*.

- Tall Grassland – occurs in the south west of the site and is characterized by the dominance of *Hyperrhennia* spp., *Themeda triandra* and low shrubs such as *Rosenia humilis*, *Selago densiflora* and *Hermannia comosa*. This is not a highly sensitive community.

- *Eragrostis truncata* Short Grassland, this appears to be an overgrazed version of the tall grassland, in which the taller species have been grazed out, leaving *Eragrostis truncata* as the dominant. This is not a sensitive community and has low biodiversity value.

- *Rhus ciliata* Shrubland occurs near the Graspan Traction Substation on shallow red soils, and forms dense stands with few other species in the actual stands. As this habitat provides cover that is not widely available at

the site it is seen as somewhat more sensitive than the surrounding open habitats.

- *Pentzia incana* Shrubland occurs on calcareous soils along the western boundary of the site, with other typical karoo shrub species such as *Lycium cinereum*, *Nenax microphylla*, *Eriocephalus spinescens*, *Plinthus karooicus* and *Asparagus capensis*. This is not a sensitive plant community as the risks of erosion and biodiversity impacts are very low.

- The pans at the site are small and the associated vegetation is not very well developed. Typical species encountered in the pans include *Sporobolus coromandelianus*, *Diplachne fusca*, *Cynodon incompletus* and *Alternanthera sessilis*. This is a sensitive plant community.

- The Rocky Outcrops are dominated by shrubs such as *Rhus ciliata*, *Rhigozum obovatum* and *Melolobium candicans*, as well as grasses such as *Enneapogon scoparius*, *Schmidtia pappophoroides*, *Digitaria eriantha*, *Heteropogon contortus* and *Melinis repens*. This is a sensitive ecosystem as it contains high plant as well as faunal diversity.

- *Aristida adscensionis* Grassland occurs in a relatively small area north of the substation. This area contains few other species other than *Aristida adscensionis*. *A.adscensionis* is frequently indicative of overgrazing, but also often dominates in areas with cracking clay soils (vertisols) as may occur in this area. This is a low biodiversity area.

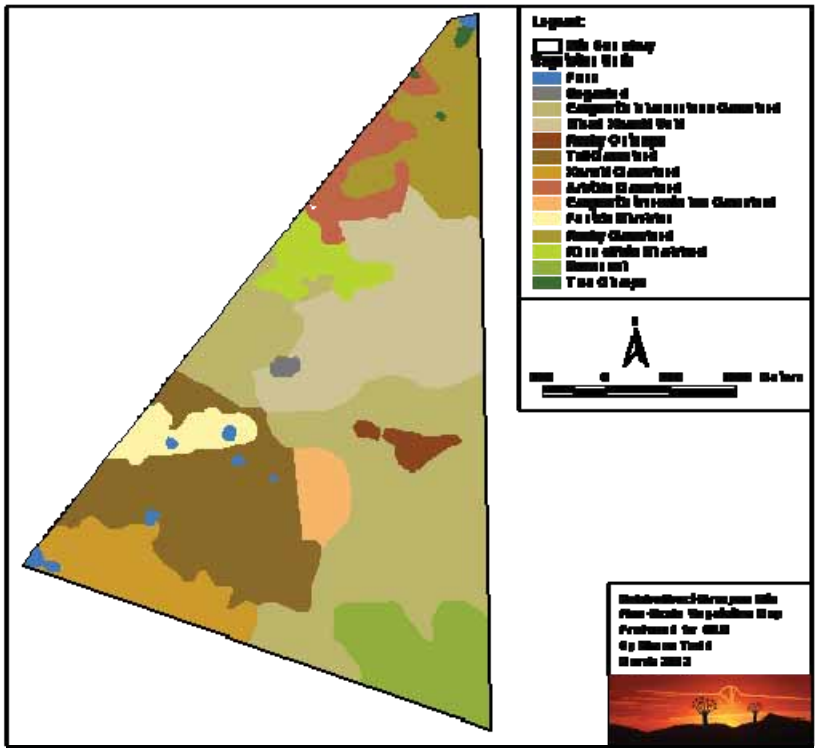
- Mixed Karroid Veld is similar to the Grassy Shrubland but contains a greater proportion of woody species and the grasses present tend to be annual species such as *Aristida adscensionis* and *Enneapogon desvauxii*.

- Grassy Shrubland is a typical Northern Upper Karoo vegetation unit and consists of a mix of common karoo shrubs and grasses such as *Eriocephalus spinescens*, *Ruschia divaricata*, *Phaeoptilum spinosum*, *Stipagrostis ciliata*, *Enneapogon desvauxii*, and the protected geophyte, *Ammocharis coranica*. This is not a sensitive plant community.

- The Rocky Grassland occupies the northern extent of the site and occurs on shallow soils with scattered exposed rock. Dominant species include *Eragrostis lehmanniana*, *Cenchrus ciliaris*, *Tetragonia fruticosa*, *Mestoklema tuberosum* and *Osteospermum leptolobum*. This is not a sensitive plant community.

- The *Acacia tortillis* Savannah vegetation unit corresponds to the Kimberly Thornveld vegetation type and within the site is characterised by the presence of *Acacia tortillis* with an understorey composed largely of *Aristida adscensionis* and *A.congesta*.

Figure 5.5 Fine-scale Vegetation Map



Source: Simon Todd, 2012

According to the SANBI SIBIS database, only one listed species *Asparagus stipulaceus* is known from the area, and is classified as Near Threatened. The validity of the records of *Asparagus stipulaceus* from the area are doubtful and probably result from outdated taxonomy, as, according the Threatened Species Programme, Red List of South African Plants (2011), it is known only from 12 locations along the coast between the Cape Peninsula and Witsand near Bredasdorp. No species that correspond to this species were observed at the site and it is highly unlikely that this species occurs in the area.

The site is relatively free of alien species. There are some alien plants around the watering points and other disturbed areas, but the veld is generally free of aliens. Alien species observed at the site include *Malva parviflora*, *Conyza bonariensis*, *Datura stramonium* and *Tagetes minuta*.

Mammals

The site falls within the distribution range of 49 terrestrial mammal species, indicating the mammalian diversity at the site is potentially quite high. Of these only the Brown Hyaena *Hyaena brunnea* (Near Threatened) and Black-footed Cat *Felis nigripes* (Vulnerable) are listed species. It is unlikely that the Brown Hyaena is abundant at the site given the agricultural activity that takes place in the area. The habitat is suitable for the Black-footed Cat which favours a mix of open and densely vegetated areas as occurs at the site. However this species is widely distributed across the arid and semi-arid areas

of South Africa, and the development would not amount to a significant amount of habitat loss for this species.

In terms of specific mammalian habitats with implications for the development, the rocky outcrops and vicinity of the pans can be singled out in this regard. Compared to the adjacent plains the rocky habitats are likely to harbor far greater species richness, particularly of small mammals. Round-eared Elephant Shrew *Macroscelides proboscideus* were observed within the rocky outcrop and are also likely to occur within the *Rhus ciliata* shrubland. The pans are also likely to be an important habitat for gerbils as well as Springhare, the burrows of which were common near the pans. Although Aardvark are wide-ranging, some areas of the site contained a higher abundance of termite mounds and Aardvark activity can be expected to be higher in these areas.

The medium to larger sized mammals which occur at the site all have home ranges which are likely to exceed the extent of the study site. The erection of fencing which prevents the movement of such animals is therefore a concern regarding the development of the site and specific mitigation measures to reduce these impacts may be required.

Reptiles

The site lies in or near the distribution range of at least 37 reptile species (Appendix 3), indicating that the reptile diversity at the site is likely to be quite low. Given the variety of habitats available at the site, a large proportion of these reptiles are however likely to be found at the site. Based on distribution maps and habitat requirements, the composition of the reptile fauna is likely to comprise one terrapin, two tortoises, 18 snakes, 13 lizards and skinks and three geckos. No listed reptile species are known from the area. Species observed at the site include, the Ground Agama *Agama aculeata*, Western Rock Skink *Mabuya sulcata sulcata* and Namaqua Sand Lizard *Pedioplanis namaquensis*. As with small mammals, the rocky areas are likely to contain the greatest reptile diversity. Several Leopard Tortoises were observed at the site and an important consideration with regards to tortoises is that no electric fencing should occur within 30 cm of the ground. Tortoises retreat into their shells when shocked and do not move away from the fence with the result that they eventually succumb to repeated electrocution. Apart from a relatively small direct loss of habitat, the shading of the soil by the solar panels is likely to impact reptile composition in these areas, as the shading is likely to alter soil temperatures, which has direct implications for cold-blooded animals. Most reptiles are also sensitive to the amount of plant cover which is also likely to be affected by the arrays. The presence of the arrays and electrical infrastructure would however create additional habitat for species which utilise such structures such as tubercled geckos (*Chondrodactylus* spp) and agamas (*Agama* spp).

Amphibians

The site lies within the distribution range of 12 amphibian species. However, given the paucity of surface water at the site, only those species able to persist away from perennial water are likely to occur at the site. Only the Giant Bullfrog *Pyxicephalus adspersus* is of conservation concern and is listed as Near Threatened. Should this species occur at the site, it would be associated with the pans. However, based on field evidence, the small pans present at the site do not hold water for sufficient periods to offer suitable breeding habitat and it is unlikely that the site represents an important area for this species. Provided that the pans and their immediate environment are avoided by the development any potential impacts on this species would be minimized as would impacts on the majority of other amphibians. Given the overall lack of specialized natural amphibian habitats present at the site, amphibians are not likely to be highly sensitive to the development.

5.1.6 Agricultural Potential

The Graspan area consists of a mix of natural veld and vacant land, which is used as general grazing land for livestock. The closest intensive agricultural centre is located 15 km east of the site and is under centre pivot irrigation. A canal system, which runs southwest from the Riet River, is used to supply this centre. The ENPAT Database provides an overview of the study area's agricultural potential, based on its soil characteristics. It should be noted this spatial dataset does not take prevailing climate into account. According to the ENPAT agricultural dataset the study area is dominated by soils which are not suited for arable agriculture, but which can still be used as grazing land. Restrictive climate characteristics, due to a low and strong seasonal rainfall regime further reduces the agricultural potential of the site.

By taking all the site characteristics (climate, geology, land use, slope and soils) into account, the agricultural potential for the majority of the study area is classified as being low for crop production while moderate for grazing. This poor agricultural potential rating is primarily due to restrictive climatic characteristics and soil depth limitations. The site is not classified as high potential, nor is it a unique dry land agricultural resource.

Figure 5.6 Typical Vegetation Type

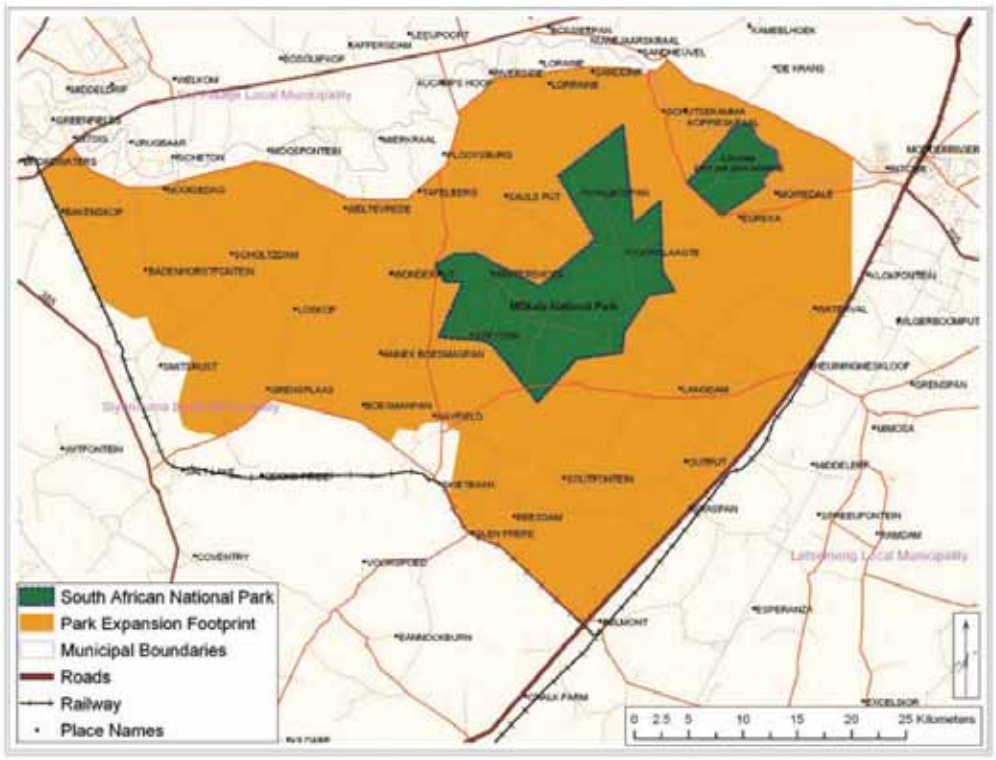
5.1.7 Protected Nature Conservation Areas

No fine-scale conservation planning has been conducted for this area. The site also does not fall within a National Protected Areas Expansion Strategy focus area, indicating that it has not been recognized as a potentially important area for future conservation efforts. In terms of the broad-scale processes operating at the site, the flat, open nature of the site suggests that few such ecological gradients and processes are likely to be operating across the site. The habitats present are largely widely available across an extensive area surrounding the site and the potential for broad-scale fragmentation or loss of connectivity is low. Perhaps the most significant habitat in this respect is the rocky outcrop, which corresponds to the Vaalbos Rocky Shrubland vegetation unit which is a naturally fragmented habitat type associated with ridges. The outcrops at the site, could serve as islands of habitat for associated species and could potentially serve as refugia or "stepping-stones". However, given their limited extent, their role in this regard is not likely to be significant.

The Mokala National Park (MNP) is located approximately 13 km to the north of the site. The park was proclaimed on 19 June 2007 to conserve the interface between the Savanna Biome and the Nama-Karoo Biome. The park currently consists of a total land area of 19611 hectares (ha). MNP falls under Siyancuma Local Municipality. The deproclamation of Vaalbos National Park (VNP) in the Northern Cape Province resulted in the establishment of MNP. VNP consisted of two sections, the largest one, the ThanDroogeveld section (18 120 ha) situated approximately 61 km north-west of Kimberley, and the smaller one, the Gras-Holpan section (4 576 ha) situated about 25 km west of Kimberley. In November 1997 and December 1998 information became available of a land claim lodged against the VNP, Than-Droogeveld section by

the Sidney -on- Vaal claimants. The land claim was legitimized and South African National Parks (SANParks) investigated five other possible locations for a replacement national park. MNP was selected as the replacement national park for its biological and topographical diversity, expansion potential, reduced threats from mining and development, and its economic potential. In November 2002 the land claim for VNP was officially gazetted. In November 2004 the negotiation process with the landowners of Wintershoek (now MNP) was officially launched and the submission report was forwarded to the Minister of Land Affairs and was signed on the 30 May 2006. SANParks took over the management of Wintershoek (MNP) on 29 May 2006. As part of the conservation and management plan strategy for MNP, there is a proposed expansion programme (see *Figure 5.7*) which would increase the size of MNP, bringing the MNP border to the N12 and adjacent to the Graspan site (South African National Parks, 2008).

Figure 5.7 Proposed Mokala National Park Expansion



Source: South African National Parks, 2008.

5.2 SOCIOECONOMIC BASELINE

5.2.1 Introduction

The purpose of this section is to describe the socio-economic environment within which the proposed project is located. The proposed development will have benefits on a national level in terms of enhancing electricity supply to the national grid. The potential socio-economic impacts resulting from the proposed project will primarily be experienced at the local level. Therefore, a brief description of the Province and District Municipality is given below, but

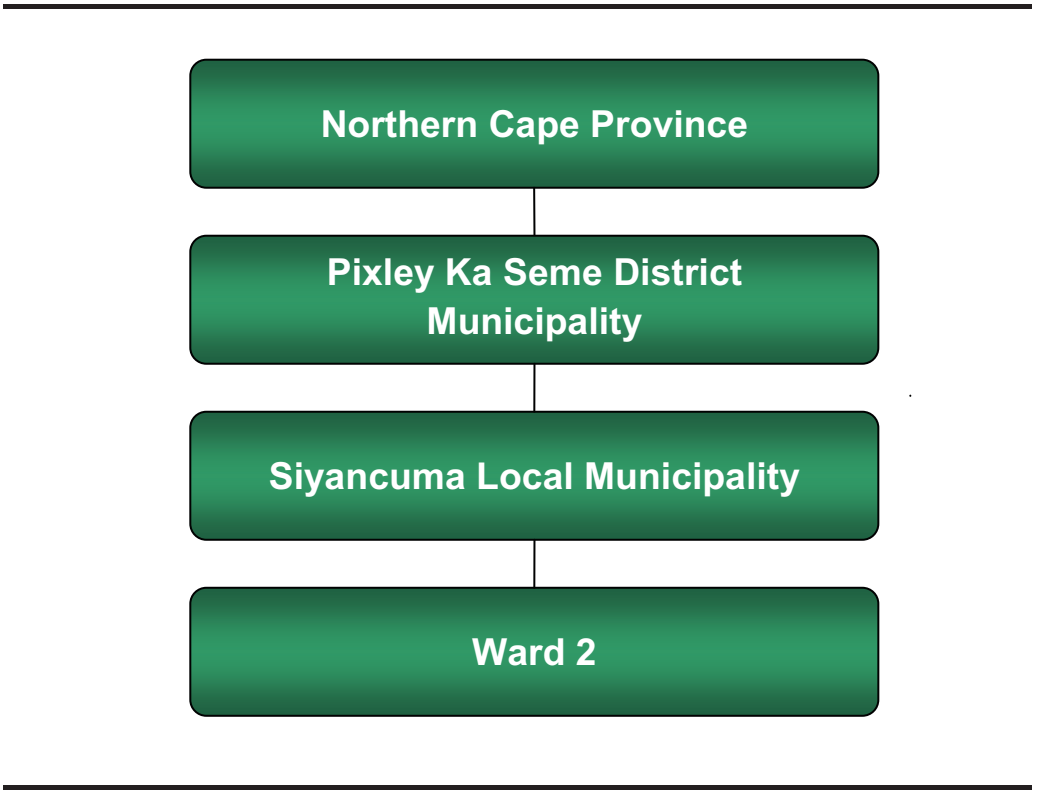
the socio-economic baseline description is focused on the local level, i.e. the Siyancuma Local Municipality.

The description provided in this section is based on publically available and high level secondary information (1). A full and more current account of the project site will be provided as part of the socio-economic study for the EIA drawing on primary data collected for this project.

5.2.2 *Administrative Structure*

The project is located within the Siyancuma Local Municipality, which falls within the Pixley Ka Seme District Municipality, in the Northern Cape (see *Figure 5.8* and *Figure 5.9*). Within this administrative structure, the provincial government is responsible for providing a strategic vision and framework for the province, as well as ensuring cooperation between municipalities and ensuring each municipality performs their respective functions. The district and local municipalities are each responsible for the provision of services and infrastructure within their municipal boundaries. This is facilitated through the development and implementation of Integrated Development Plans (IDPs), Spatial Development Frameworks (SDF) and Local Economic Development (LED) Plans.

Figure 5.8 ***Administrative Structure***



(1) The secondary information available for the Siyancuma Local Municipality is extremely limited.

5.2.3 *Provincial Context*

The proposed Graspan Solar Park is located in the Northern Cape Province, the largest province in South Africa, measuring 361,830 km$^{2.}$ The primary metropolitan areas within the Northern Cape, include Kimberly and Upington. Smaller district towns include Douglas, De Aar, Prieska, Victoria West, Hopetown and Colesburg.

The Northern Cape is the least populous province in South Africa, containing approximately 1.8 percent of national population. The Province has a high poverty rate (1) despite the fact that the *per capita* GDP in the Northern Cape is higher than the national average (2). The poverty rate for the Province is 48.5 percent, which is slightly lower than the National average. Poverty rates differ vastly between racial groups, with low poverty rates among the White and Asian populations, and high poverty rates among Coloured (53.3 percent) and African (58.7 percent) population groups (3). Over two thirds (70 percent) of the population live in urban areas, despite the vast extent of the Province. This is slighter higher than the national trend, where the average urban-rural split 63-37 (4).

The Northern Cape faces the challenge of high unemployment rates and low income levels. The unemployment rate in the Province is 26.7 percent, which is above the national average of 23.9 percent (5).

5.2.4 *The Pixley Ka Seme District Municipality*

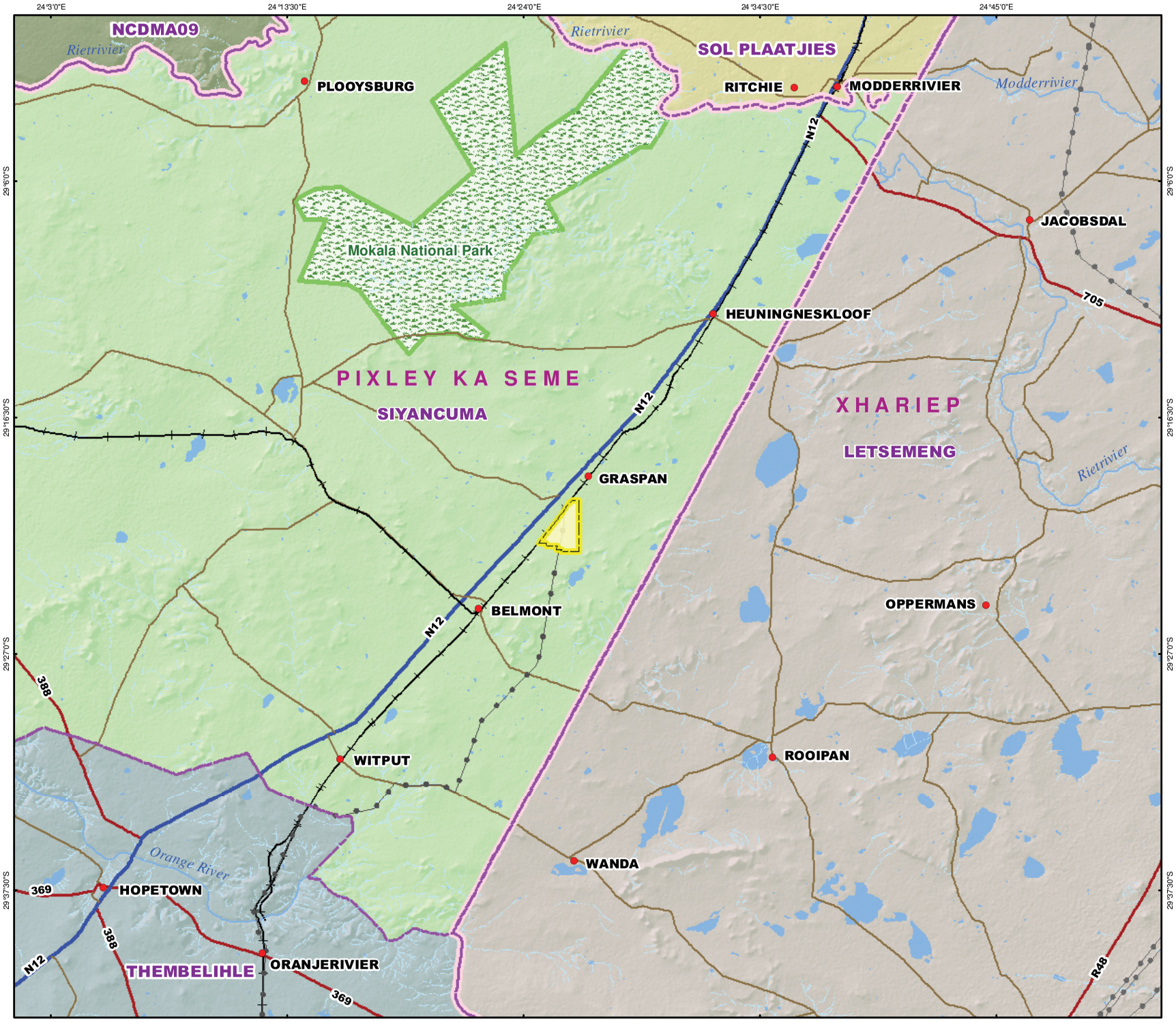
The Pixley Ka Seme District Municipality PKDM is one of five District Municipalities in the Northern Cape. It is located in the south eastern portion of the Northern Cape and is bordered by the Free State, Eastern Cape and Western Cape. The District is approximately 102,272 km^2 in size. There are eight Local Municipalities (LM) within the District Municipality, namely, Emthajeni LM, Kareeberg LM, Renosterberg LM, Siancuma LM, Siyathemba LM, Thembelihle LM, Ubuntu LM, and Umsobomvu LM.

According to the 2007 Community Survey, the population of the PKDM is approximately 164,412, accounting for 16.9 percent of the total population in the Northern Cape. The population density within the District is 1.6 persons per km^{2,} which is lower than that of the Provincial population density of 2.27 persons per km^2. Forty one (41) percent of the population within the District is under the age of 20 years (6).

The PKDM is considered largely rural, with small to medium urban centers, such as Douglas, De Aar, Prieska, Victoria West, Hopetown and Colesburg.

(1) The poverty rate is defined as the number of people earning less than the minimum level of income deemed adequate in a country. The World Bank uses the figure of $1.25 per day.
(2) PROVIDE: Project Background Paper 2005.
(3) PROVIDE Project Background Paper 2005.
(4) PROVIDE Project Background Paper 2005.
(5) Unemployment rate for Q4 2011 according to Statssa.
(6)Statistics South Africa, Community Survey, 2007

The District Municipality faces high poverty rates, with an estimated 63.5 percent of the population living in poverty, significantly higher than the Provincial rate of 48.5 percent. As with the Provincial trend, the poverty rate is more prevalent amongst the African and Coloured population groups.



Legend

- Graspan Photovoltaic (PV) Power Facility
- Towns
- Perennial River
- Non-Perennial River
- Water Bodies
- National Route
- Arterial Route
- Secondary Road
- Railway Line
- Power Line
- National Park
- District Municipalities

Local Municipalities

- Letsemeng (FS161)
- Siyancuma (NC078)
- Sol Plaatjie (NC091)
- Thembelihle (NC076)
- (NCDMA09)

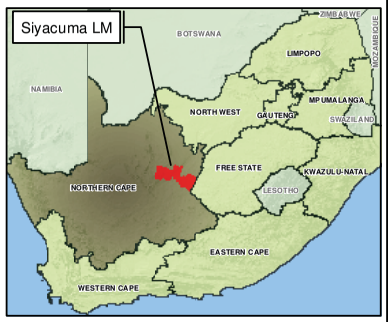


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Figure 5.9: Municipal Boundaries of Surrounding Area

CLIENT:

solairedirect
Southern Africa
The solar MWh company

DATE: Mar 2012	CHECKED: DA	PROJECT: 0156408
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 300 000

DRAWING: Graspan Location of SP Munic.mxd

REV: 0

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Projection: Geographic: WGS84
Source: Chief Directorate National Geo-Spatial Information - Base data, Demarcation Board - Municipality data. Inset Map: Esri Data & Maps

SIZE: A3

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5.2.5 *The Siyancuma Local Municipality*

The proposed Graspan Site is located within a rural setting along the N12 and is approximately 75km south of the town of Kimberley and 45km northwest of Hopetown. The Site is situated on farm Graspan 172, the farm is 1,346ha.

The Siyancuma Local Municipality (SLM), one of the eight local municipalities within the Pixely Sa Keme District Municipality, is approximately 9,885km^2. The administrative centre of the SLM is located in the town of Douglas. There are six Wards within the Municipality and the Graspan site is located in Ward 2. The Vaal and Orange Rivers run through the SLM and are important from an agricultural perspective. The N12 National Road bisects the Municipality from north to south and links a number of the smaller towns to Kimberley, the Capital of the Northern Cape.

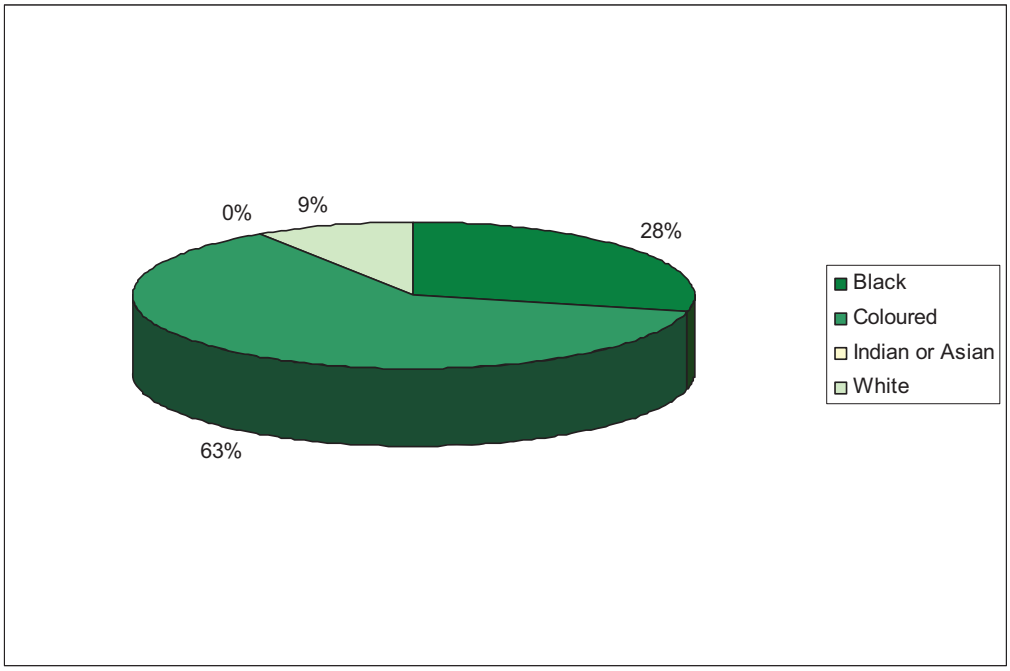
The sections below provide a description of the socio-economic conditions in the Siyancuma Local Municipality.

Population Demographics

The population in the SLM was estimated to be 35,967 at the time of the 2007 Community Survey, totaling approximately 22 percent of the Pixley Ka Seme District Municipality population. The population size has changed very little since 2001, when it was 35,809 (1). Females represent 52 percent of the population, while males account for 48 percent. The racial composition of the SLM comprises of 28 percent Africans, 63 percent Coloured and nine percent White people (2) (see *Figure 5.10*). In 2007 there were only three Asian or Indian people living in the Municipality.

(1) Statistics South Africa, Community Survey, 2007
(2) Community Survey, 2007

Figure 5.10 Population groups within the Siyancuma Local Municipality in 2007



Source: Statistics South Africa: Community Survey, 2007

Education

General education levels are low within the SLM. An estimated 20.3 percent of the population over 20 years of age are regarded as illiterate, as they have not received any schooling. It is estimated that 66.6 percent of the population over 20 years have completed schooling (from Grade 0 to Grade 12), and a low 7.3 percent have attained a higher education qualification (1). Over half (56 percent) of those with a higher education are White, while only 23 percent are African and 21 percent are Coloured. This indicates that there is a lack of highly skilled previously disadvantaged people within the SLM. A lower percentage of males (48 percent) have completed schooling compared to females (56 percent), which is not aligned with the District Municipality where 52 percent of males completed schooling compared to 48 percent of females. This may indicate that more males have chosen to leave school and enter into the workforce.

Employment and Livelihoods

The economically active population (aged 16 – 65 years) of the SLM was estimated to be 22,862 people in 2007, making up 63.6 percent of the total population. Of that total, 34 percent are employed, while 17 percent are unemployed. A further 49 percent are considered economically inactive (2). The unemployment rate in SLM is slightly lower than that of the Province

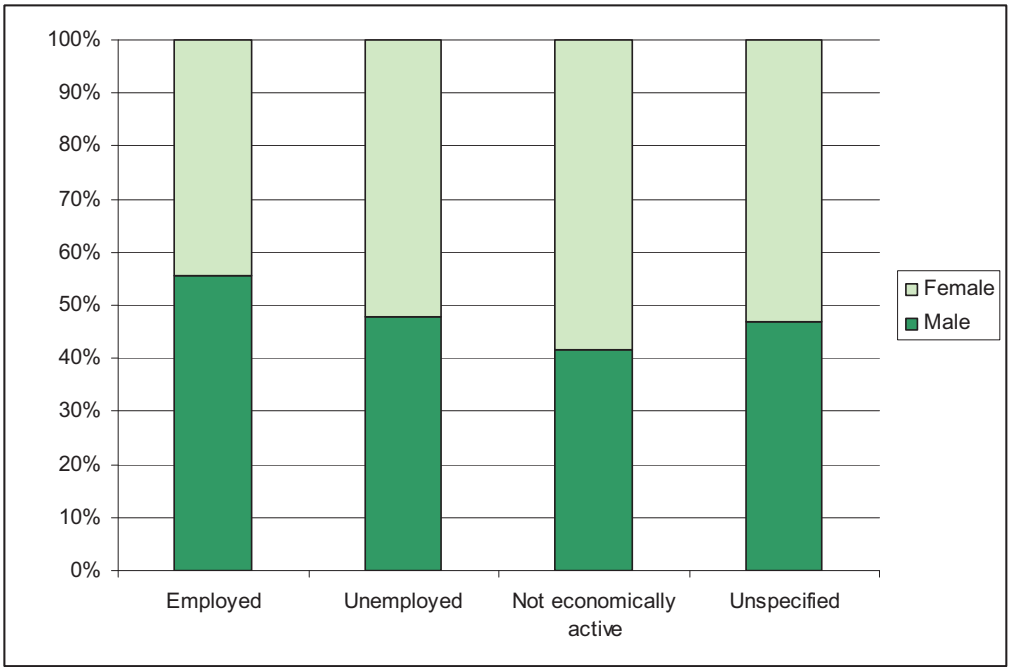
(1) Statistics South Africa, Census 2001

(2) Economically inactive population refers to students, elderly, sick, differently-abled persons and people who choose not to work.

(18 percent); however, the SLM does have a higher population of economically inactive people when compared to that of the Province, (42 percent).

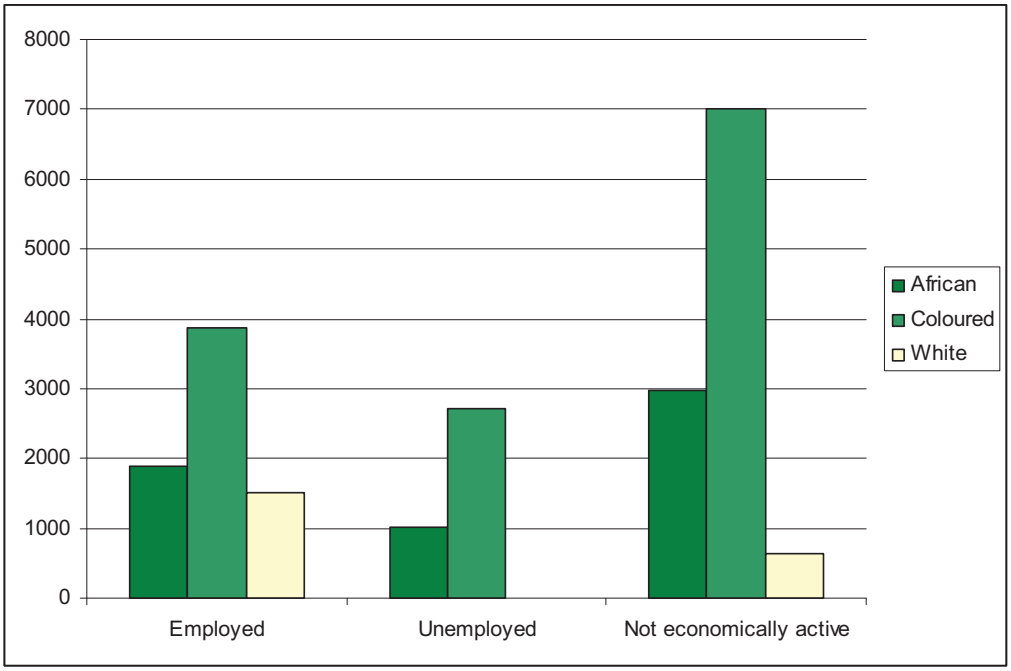
There is a difference in the employment rate between male and female, with males comprising approximately 55 percent of the employed population within the SLM, see *Figure 5.11.* Females make up a significantly larger portion of the unemployed and economically inactive population, as shown in *Figure 5.11* below. *Figure 5.12* shows that the unemployed and economically inactive population consists largely of previously disadvantaged South Africans, i.e. African and Coloured groups. In contrast, unemployment is extremely low among the White population group.

Figure 5.11 Employment by Gender in 2007



Source: Statistics South Africa: Community Survey, 2007

Figure 5.12 Employment by Race in 2007

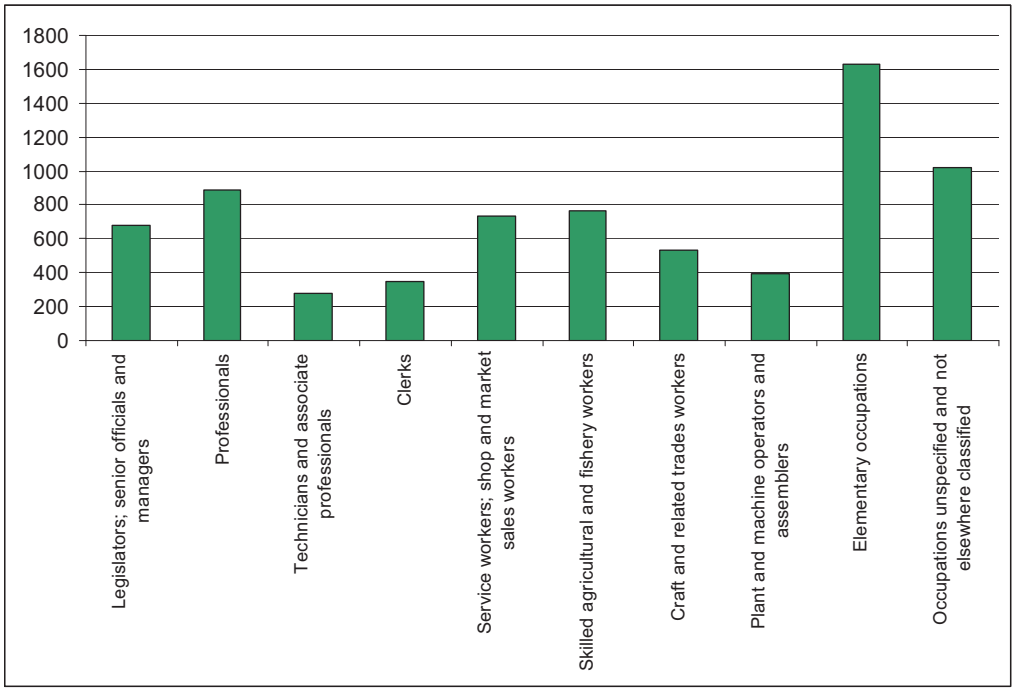


Source: Statistics South Africa: Community Survey, 2007

The main occupations undertaken by those living in SLM are shown in *Figure 5.13* below. Elementary occupations i.e. occupations which require unskilled labour, were the dominant occupation (23 percent) in 2007 (1). Twelve percent of the SLM undertake professional occupations and 11 percent are considered skilled agricultural and fishery workers. Ten percent of the population undertake occupations such as shop and market sales workers, while occupations such as clerks; legislators and senior officials; and service workers, each comprise of less than ten percent of the occupations within the SLM. The high percentage of people with elementary occupations reflects the lack of skills training and higher education in the SLM, and the low numbers of people with professional occupations may be influenced by the lack of availability of such jobs, given the rural nature of the area.

(1) Statistics South Africa: Community Survey, 2007

Figure 5.13 Primary Occupations within the Local Municipality



Source: Community Survey, 2007

According to the Community Survey 2007, the primary employment sector within the SLM is agriculture, hunting, forestry and fishing, employing 30 percent of the working population, (see *Table 5.1*). The next most dominant sector is community; social and personal services, employing approximately 20 percent of the working population, followed by wholesale and retail trade, and manufacturing employing 8 percent each(1).. As shown in *Table 5.1* other sectors such as, financial and business service, construction and transport, each employ less than ten percent of the population of the Municipality.

Table 5.1 The Main Employment Sectors in 2007

Sector	Percentage
Agriculture; hunting; forestry and fishing	30%
Community; social and personal services	20%
Manufacturing	8%
Wholesale and retail trade	8%
Financial; insurance; real estate and business services	6%
Transport; storage and communication	3%
Construction	2%
Electricity; gas and water supply	1%
Mining and quarrying	0%
Undetermined, unspecified	20%

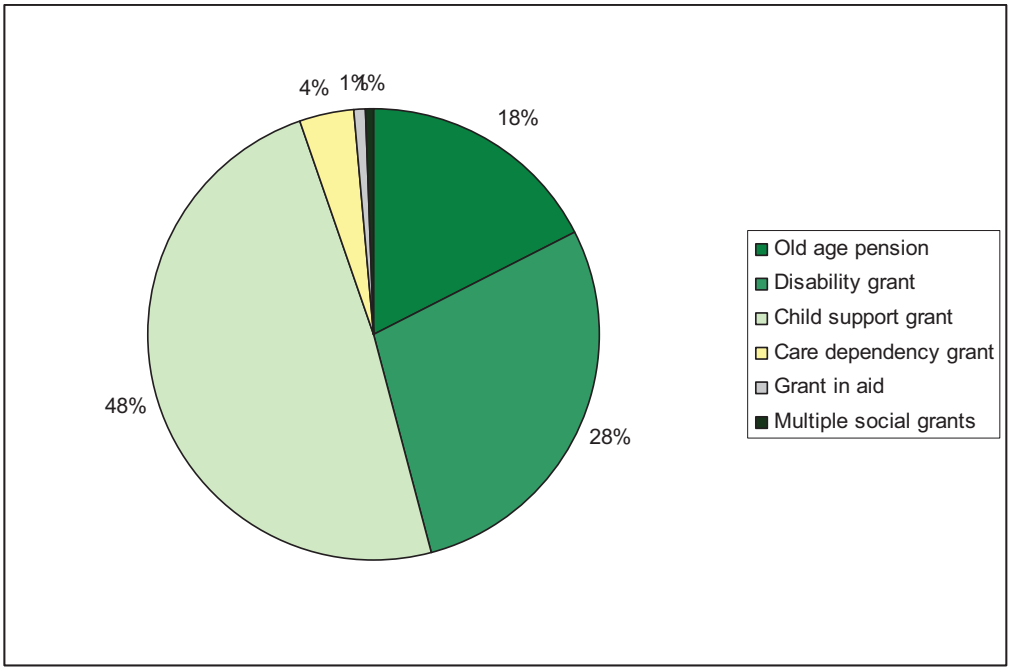
Source: Community Survey, 2007

(1) Statistics South Africa: Community Survey, 2007

Within SLM, 48.8 percent of the economically active population reported that they had no income in the 2007 Community Survey, while 30 percent reportedly earn a low income of below R 1,600 per month. A smaller number, 10.3 percent, earn between R 1,601 and R 12,800 per month. Only 1.2 percent earn between 12,801 and 52,200 per month, and 0.4 percent reported earning above R 51 200 per month [1]. The high percentage of people who earn low to no income can be attributed to the high unemployment rate and dominance of elementary (unskilled/ low skilled) occupations in the Municipality.

In addition to low income levels, a significant portion (30 percent in 2007) [2] of the SLM population are dependant on receiving social grants from the Government. As shown in *Figure 5.14* the main social grants received by people in the Municipality are child support grant grants (48 percent), disability grants (28 percent) and old age pensions (18 percent).

Figure 5.14 Social Grant Recipients in 2007



Source: Statistics South Africa: Community Survey, 2007

Local Economy

According to the Water Services Development Plan, Siyancuma Municipality 2011/12, agriculture, fishing and forestry form the backbone of the local economy, contributing 27 percent towards the Municipal Gross Geographic Product [3] (GGP). The tertiary sector (finance and insurance) contribute nine percent, manufacturing contributes three percent and mining/ quarrying

(1) Statistics South Africa: Community Survey, 2007
(2) Statistics South Africa: Community Survey, 2007
(3) The gross geographic product (GGP) of a particular area amounts to the total income or payment received by the production factors – (land, labour, capital, and entrepreneurship) – for their participation in the production within that area. (http://www.environment.gov.za/enviro-info/nat/ggp.htm).

only contributes one percent towards the GGP. The Northern Cape contributes a low 2.4 percent towards the National Gross Domestic Product (GDP).

Surrounding Landuse

As mentioned above, the Graspan Site is located in a rural setting, between Kimberley and Hopetown. The surrounding landuse is predominantly agriculture, natural areas and tourism. These are discussed in more detail below.

Agriculture

As mentioned above, agriculture is an important sector in the Siyancuma Local Municipality. There are two primary types of farming activities that take place in the area, namely, dryland farming and intense irrigation farming. The irrigation farming takes places along the Vaal and Orange Rivers, where water from the rivers can be used to irrigate lucerne, wheat, oats, maize and vegetables. The irrigated fields also facilitate dairy farming. The drylands farming in the area consists of stock farming, (sheep, cattle, goats), ostrich farming and game. The Graspan site is considered dryland farming and the main activities on the site is stock farming (sheep and cattle).

Tourism Activities

The site is located along the N12 National Road, which is an important inland road, running from Johannesburg through Kimberley, Beaufort West and ultimately ending in George. Therefore, much of the domestic tourism in the area consists of travellers passing through the area on route to final destinations elsewhere.

The town of Kimberly, which is rich in mining history, attracts local and international tourists. Tourist attractions in around Kimberly include:

- The Big Hole and Mining Museum – the Big Hole is an old open cast mine, where diamonds were mined during the late 1800's and early 1900's. It is commonly referred to as the largest "hand dug" excavation site in the world.
- The Belgravia Historical Walk – this is a historical walk around Kimberly centred on old Victorian buildings constructed during the mining boom.
- The Kamfers Dam – the dam located two kilometres north of Kimberly is home to one of the largest populations of Lesser Flamingo in South Africa.

The Mattanu Private Game Reserve is located approximately 20 km north of the Graspan Site. The reserve offers accommodation, conference facilities, game drives and helicopter game viewing rides.

There is a Boer War monument dedicated to those who lost their lives during the Battle of Graspan in 1899, located on the farm adjacent to the Graspan Site.

Communities

The Graspan community is a small community centred around the railway siding, located approximately two kilometres north of the Graspan Site. The community consists of a number of dwellings and some abandon buildings.

Existing Infrastructure on the Project Site

The landowner's dwelling is located on the western portion of the site, and is not considered part of the development area. There are a number of farm dams located on site. There is an existing 132kV overhead transmission line that traverses the site and links into an existing substation on the site. There is a railway line that traverses the site in a north-south direction. The fencing and gates on site are well maintained.

Figure 5.15 View of site, looking north, showing existing 132kV transmission line and substation

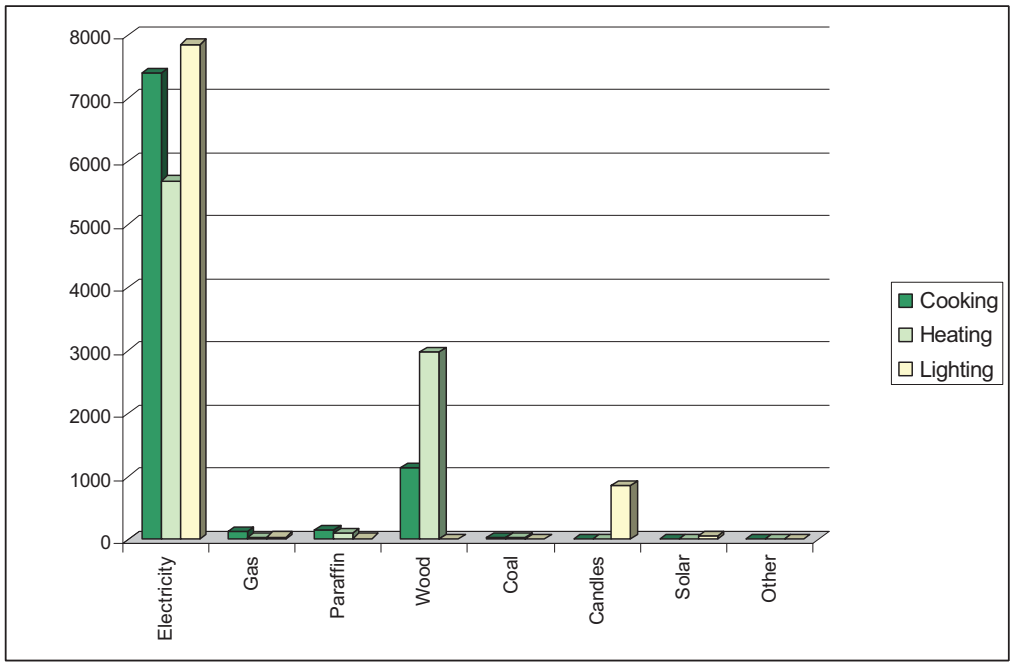
Health

Due to the rural nature of the SLM, people have to travel long distances to access health facilities, therefore, the need for mobile clinics and additional 24hrs services are a high priority. Other challenges include insufficient clinic staff and there is no functional District HIV/AIDS Council.

Energy

The majority of the households within the Siyancuma Local Municipality (89 percent) have access to electricity. It is primarily used for lighting heating and cooking, as shown in *Figure 5.16* below. Households that do not have access to electricity make use other sources of fuel, for example, candles are used for lighting in 10 percent of the households in SLM. Wood is used for cooking by 13 percent of the households and for heating by 34 percent of households (Community Survey 2007).

Figure 5.16 Household Energy Sources and Uses in 2007



Source: Statistics South Africa: Community Survey, 2007

Water

Access to water within the SLM is good and according to the 2007 Community Survey, an estimated 56 percent of households in the SLM have access to tap water inside their homes, while 32 percent have access to water outside their homes (within their yard). Four percent of households have access to piped water from an access point outside of their yard and eight percent do not have access to piped water and obtain water from boreholes, dams, rainwater tanks or streams.

Housing

A large portion (79 percent) of the population of SLM live in a house on a separate stand or yard, while 14 percent reside in an informal dwelling/ shack that is not in a back yard. Two percent live in informal dwellings/ shacks that

are located in a backyard, while another two percent of the population live in a block of flats [1].

Access to Technology

In 2007, only 12 percent of households within the SLM had had access to a computer, and three percent access to the internet. In contrast, an estimated 62 percent of households had access to a cell phone [2].

5.2.6 Palaeontology, Archaeology and Cultural Heritage

Palaeontology

The geology of the farm Graspan contains rocks of the Tierberg Formation, Ecca Group and Karoo Supergroup which are Early Permian in age (approximately 270 million years). The rocks consist of mudstones, sandstone and minor conglomerate deposited in a shallow marine setting. Most of the fossils of the Ecca Group have been recovered from the underlying Whitehill Formation and include several species of fish, crustaceans, deepwater marine reptiles and beetles. The Tierberg Formation preserves parts of small vertebrates such as fish teeth and scales, plant fragments and petrified wood. The most common fossils in this formation are trace fossils. The Ecca Group sediments on Graspan are intruded by non-fossiliferous Early Jurassic Karoo dolerite. Part of the Ecca Group on Graspan is overlain by Late Cenozoic superficial deposits.

Archaeology

Very little is known of the pre-colonial archaeology of this area. There are no records on the national SAHRA database (2009) with the exception of the survey conducted by Nel (2008) along the railway line. The closest archaeological surveys were conducted along the Riet River some 40km north-east of the site.

The Riet River area has attracted prehistoric human settlement since early Stone Age times and is of particular interest because of the occurrence of the so-called "Riet River Burials" along the banks of the river (Humphreys 1970). Some 57 burials were excavated around the Koffiefontein area by an amateur archaeologist from 1922-1946. Brink et al. (1992) have undertaken a rescue excavation of human remains at Pramberg, some 15km south of Jacobsdal. They recorded at least 11 cairns on the site and a physical anthropological study of the human remains indicated that they were of Khoisan origin.

Rossouw (2011) has investigated an area on the lower reaches of the Riet River and notes that the river terraces contain Stone Age sites, pastoralist settlements, rock art and rock engravings and remnants of 19th century

(1) Statistics South Africa: Community Survey, 2007
(2) Statistics South Africa: Community Survey, 2007

farmsteads and kraals. In addition Rossouw (2011) observes that rock engravings are frequently found on rocky outcrops (dolerite koppies) along the Riet River and the surrounding hills. Rossouw's survey, however, failed to find any Stone Age exposures.

Van Jaarsveld's (2006) survey of the Hydra-Perseus and Beta-Perseus transmission lines, which pass to the east of the area, was of a very general nature and failed to identify specific heritage resources along the route with the exception of towns

Cultural Heritage

The Graspan area is of historical importance because of the Battle of Graspan (also known as Enslin or Rooilaagte) which took place over a large area, commencing some 2.5km to the north of the proposed facility. The battle was an important engagement of the Second Anglo-South African War of 1899-1902. By the end of 1899, Lord Methuen was moving northward along the railway line with a large British force, intent on relieving the siege of Kimberley.

The Battle of Belmont had taken place on the 23 November 1899. The Boers, some 2 500 strong, fell back to the next railway station, Graspan along the line, where they occupied positions on the neighbouring koppies. They were in possession of a number of guns and they were posted on five koppies over 200 feet in height, overlooking the railway line.

The railway line to Kimberley had been completed in 1885. The introduction of barbed wire fencing dates to about the same time. The accounts of the battle describe the veld as being hard red sandy soil covered in low shrub, with the occasional ant hill, behind which soldiers attempted to seek shelter. The koppies were precipitous, needing both hands to scale the heights.
The British troops advanced up along the railway line from Belmont to Graspan. In advance of the troops was an armoured train. The naval guns were brought by rail behind the armoured train and they came under attack as soon as they reached the station, indicating that the sphere of battle extended over a wide area, commencing at the Graspan railway station in a north-easterly direction.

The Battle of Graspan dates to the 25 November 1899. British troops advanced across the open countryside and stormed the Boer's hilltop positions. After taking the koppies, they gave chase to the Boers as they rode away across the veld. Most of the military action therefore seems to have taken place between Graspan station and the surrounding hills.

The British casualties amounted to some 197 men, while the Boers are thought to have lost around 20 men. The dead were buried in graves near to the battlefield, but according to Morris (pers comm.) were exhumed in 1963 and re-interred in the Garden of Rememberance, West End Cemetery, Kimberley. Since the exhumation was undertaken by an undertaker, it is possible not all

human remains were recovered and that some might still be located at the original place of burial.

Cultural Sense of Place

The site and surrounds has a rural character consisting mainly of open grassland, with clumps of trees around farmsteads, such as the Graspan homestead to the west of the site. Farmsteads in the area tend to be 2km or more apart, combined with the large extent of open farmland create a sense of openness and space in the Karoo landscape.

6 PRELIMINARY IDENTIFICATION OF IMPACTS

6.1 INTRODUCTION

A key part of the Scoping Process is a preliminary identification and consideration of the ways in which the project may interact (positively and negatively) with environmental and socio-economic resources or receptors. The issues that are identified as potentially significant during the Scoping Process provide focus for more detailed specialist studies for the EIA. Each of the potential issues will be briefly described in this section while the significance of any resulting impacts will be discussed and assessed in more detail in the EIR.

6.2 DESCRIPTION OF POTENTIAL IMPACTS

The potential impacts on environmental and social resources arising from the proposed development include direct and indirect impacts. Potential impacts will also be linked to the different stages of the project which are identified as construction, operation and decommissioning.

Table 6.1 provides an overview of likely aspects arising from each of the key project activities and considers their likely interaction with socio-economic and environmental resources and receptors.

Table 6.1 Interaction between Project Activities and Receiving Environment

Project Activities	**Receptor/Resource**									
	Fauna	Flora	Soils	Hydrology	Traffic and Transport	Air Quality	Land Use and Agricultural Potential	Landscape and Visual Amenity	Heritage/Archaeology/Palaeontology	Socio-economics
Pre-construction and Construction										
Clearance of Vegetation	■	■	■	■		■		■	■	■
Construction of Access Roads	■	■	■	■	■	■		■	■	■
Construction of Temp. Construction Camp	■	■	■	■		■		■	■	■
Site Levelling and Grading			■	■		■			■	■

Underground Cables/Overhead lines	■	■	■	■					■	■
PV Panel Delivery and Erection								■		■
Construction of Service Building				■				■	■	■
Construction of New Grid Connection Substation				■				■	■	■
Hard Standing Area Rehabilitation	■	■	■					■		■
Operation										
PV Panel Operation								■		
Use of Access Roads	■							■		
Use of Buildings	■							■		
Site Maintenance and Security										■
Decommissioning										
Removal of PV Panels	■	■						■		■
Removal of Foundations	■	■		■				■		■
Removal of Access Roads	■	■		■				■		■
Removal of Underground Cables	■	■						■		■
Site Restoration & Rehabilitation	■	■	■	■		■		■		■

Note: This interactions matrix will be continually developed throughout the EIA process.
Key: Shaded box indicates potential interaction between the project and resource or receptor.

6.3 POTENTIALLY SIGNIFICANT ISSUES

The following section describes potentially significant issues based on the initial site visit, discussions with the project team, issues and concerns raised by I&APs during the initial notification process and available information about the environmental effects of similar solar energy developments. It is likely that many of these impacts can be adequately addressed through the implementation of appropriate mitigation and management measures, however, some require further specialist investigation as part of the EIA as indicated.

6.3.1 Noise and Vibration

During the construction phase, construction vehicles including delivery trucks and minimal excavation equipment may produce a slight increase in noise disturbance. Impacts are likely to be minimal due to the methods of construction to be used, i.e. poles will be hammered or rammed into the ground. Delivery vehicles may create some noise and vibration along access routes. The site however, is located in a rural setting with few or no receptors considered sensitive within close proximity to the site.

Increased noise levels are not anticipated during the operational phase of the development.

Potential noise impacts will be addressed in the EIR and appropriate mitigation measures if considered necessary will be included in the draft Environmental Management Plan (EMP).

6.3.2 Dust

Limited dust generation may occur during vegetation clearance, transportation of materials for construction, cable trenching and the construction of buildings. Dust will be a temporary impact associated with the construction phase of the project. Taking into consideration the distance of sensitive receptors to the site, impacts from increased dust are not likely to be significant.

No dust generation is expected to occur during the operational phase of the project, except for minimal dust created by maintenance vehicles along gravel roads, which is expected to be infrequent.

Appropriate measures to manage impacts associated with dust generation will be developed during the EIA phase of the project and identified in the draft EMP, if necessary.

6.3.3 Loss of Agricultural Land

The Graspan site is currently zoned for agriculture (livestock grazing). The construction activities and the establishment of the PV power facility will result in a reduction in the area of land that is available for livestock grazing, as the PV array area will be fenced off.

The potential impact of loss of grazing land will be assessed in the EIR and appropriate mitigation measures will be included in the draft EMP where necessary.

6.3.4 Loss of, or Damage to Palaeontology, Archaeological or Cultural Heritage Resources

Section 38 of the National Heritage Resources Act states that any person who intends to undertake a development categorised as-

'(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
(c) any development or other activity which will change the character of a site -
(i) exceeding 5,000 m^2 in extent;'

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Excavations required for the installation of PV arrays, road construction, laying of cables etc. and land clearing could disturb or destroy features of cultural heritage interest, if they exist in the area. These potential impacts will be assessed through a heritage specialist study in the EIA phase along with the required submissions to South African Heritage Resource Agency (SAHRA).

6.3.5 Visual and Aesthetic Landscape Impacts

There are a number of existing man-made features including power lines, Eskom's Graspan Traction Substation, a railway line and roads in the local landscape. However, the proposed development will result in a significant change to the local landscape character. The development is likely to impact the overall sense of place of the wider area. The PV panels will cover up to 150ha (1.50km^2) in total and the PV arrays will be seen from visual receptors in the area. It should be noted that the height of the proposed infrastructure for the proposed PV power facility will be considerably lower than that of the existing infrastructure in the area, i.e. Eskom's Graspan Traction Substation, power lines and the railway infrastructure.

The EIA will consider the effects that the new PV power facility will have on the landscape character and effects upon potential viewers. The site is located in a rural area and is relatively flat and as such the visual impact of the PV power facility is regarded as a potentially important consequence of the proposed development.

A specialist landscape and visual impact assessment will be undertaken during the EIA phase to assess the visual impacts of the development and the identification of appropriate mitigation and management measures to be included in the draft EMP, if necessary.

6.3.6 Impact on Flora, Fauna and Habitats

The development of the proposed PV power facility could result in impacts on flora and fauna due to disturbance, displacement or direct habitat loss. The disturbance associated with construction activities can also result in the introduction and rapid colonisation of alien (non-native) species. The following key potential impacts may result from the proposed development:

- Loss of habitat for floral and faunal species;
- Displacement of certain faunal species, temporarily or permanently from the establishment of the proposed development;
- Fragmentation of habitat and faunal populations through presence of security boundary fencing around the development; and
- Electrocution of birds from increased overhead power lines.

A botanical and ecological specialist study will be undertaken during the EIA phase to assess the impact on terrestrial flora and fauna and the identification

of appropriate mitigation and management measures to be included in the draft EMP.

6.3.7 Impact on Traffic during Construction

There may be a minor increase in traffic during the construction of the proposed PV power facility as a number of trucks will be required to transport infrastructure, equipment and construction materials onto site and earth-moving vehicles will be involved in construction activities.

Further information regarding traffic levels and an assessment of significance will be provided in the EIR.

6.3.8 Impacts Due to Waste Generation

Waste from the construction activities may arise from a range of sources including the following:

- minimal excavated material (eg rock and soil);
- waste from construction workers living on and using the site; and
- waste from equipment, packaging, materials and vehicles.

Following the construction phase, there will be limited waste production during the operational phase. Specific requirements for waste management and disposal will be identified in the draft EMP developed during the EIA phase of the project.

6.3.9 Soils, Geology, Hydrology and Erosion Potential

The potential effects on soils and geology from construction and decommissioning may include:

- the potential for soil properties at the site to be permanently altered due to site preparation (e.g. compaction of soil);
- the potential for the drainage lines across the site to be subject to flash floods; and
- site preparation and vegetation clearance activities which could cause instability and increased erosion potential.

These impacts can be easily mitigated or managed through the implementation of various measures such as avoiding placing infrastructure along or in dry drainage lines, for example. The project will require water-inputs during construction and operation, and removal of vegetation and the development of access roads and hard standing surfaces (e.g. compacted temporary construction camp and service buildings) may impact surface water flow and run off within the site area and near surrounds, during both the construction and operational phases. It is not proposed to use impermeable concrete hard standing areas which will reduce any potential impacts to surface water flow.

The potential impacts discussed above and any further impacts identified during the EIA will be further investigated in the EIR. These will be accompanied by the identification of appropriate mitigation and management measures, such as specific measures to manage surface water run-off, during the EIA phase and included in the draft EMP.

6.3.10 Surface Water and Groundwater Contamination

The potential for surface water contamination is an important consideration in relation to the construction of the PV power facility. Soil erosion leading to increased sediment load in surface water runoff could impact on drainage channels in the local area. The potential for groundwater contamination is associated with uncontrolled spills of fuels and lubricants during the construction phase. Fuel storage on site will be limited to bunded areas. The extent and impact of potential groundwater or surface water contamination is largely dependent on the nature of the subsurface soil conditions, their transmissivity and susceptibility to erosion. Apart from the permeability of the soil substrate, groundwater contamination could also occur through joints, fractures and contact zones associated with the geology.

Basic precautions to prevent groundwater and surface water impact during construction will be identified in the draft EMP developed during the EIA phase of the project.

6.3.11 Socio-Economic Impacts

Employment and procurement have been the issues of most interest to local stakeholders to date, and this is likely to continue. If managed well, it is the impact area with the greatest potential to have a significant positive effect on the local area.

PV power facilities generate the largest employment levels per MW of electricity generated in comparison to other generation types. Employment opportunities will arise from the proposed development over the duration of the development, i.e. from the construction phase through to decommissioning. Solaire Direct have constructed, operated and maintained a number of PV power facilities in France, North Africa, India and South America as well as South Africa and based on these experiences it is considered that 110-120 full time workers will be required during construction of the 90MW PV power facility. As the development will be phased, these numbers are likely to fluctuate depending of the size of the stage being built at the time. Those employed during construction will receive training in the renewable energy sector which is an industry currently emerging in South Africa. The skill sets learned will be valuable and transferable elsewhere. During the operational phase a number of these employees will continue employment at the plant for maintenance purposes. These aspects will be explored more fully during the impact assessment phase.

Impacts associated with the accommodation of construction workers during the construction phase and the option of housing them on or off the site will be assessed further in the EIA phase.

A specialist study will be undertaken in the EIA phase to assess the potential impacts of the project including those related to direct and indirect employment opportunities.

6.3.12 Human Health and Safety

As with any construction project, there is potential for impacts on human health and safety to occur as a result of accidents and unplanned events that may occur during the construction of the PV power facility.

The risk of injury associated with the construction of the PV power facility will be mainly limited to the subcontractors (as the site will be secured to avoid public incursion into the active development area), but there remains some risk of injury to other site users (i.e. farm workers). Basic safety precautions and protective measures will be specified in the draft EMP which, in turn, will be incorporated into subcontractor health and safety plans.

6.4 SCREENING OF IMPACTS

The preceding *Section 6.3* describes a number of potentially significant impacts associated with the proposed development. One of the purposes of Scoping is to offer a preliminary, qualitative assessment of potential environmental and social impacts associated with the project, thereby ensuring that those impacts that are potentially significant are assessed in the EIA Phase.

The following impacts have been identified and described above:

- noise impacts;
- impacts due to dust;
- loss of agricultural land;
- loss to archaeological, palaeontology and cultural heritage;
- visual and landscape impacts;
- impact on flora, fauna and habitats;
- impact on traffic;
- impact of waste generation;
- impact on soils, geology, hydrology and erosion potential;
- impact on surface and groundwater;
- socio-economic impacts; and
- health and safety.

The impacts which require further investigation through specialist studies are the following:

- loss to archaeological, palaeontology and cultural heritage;
- visual and landscape;
- loss of agricultural land;
- natural vegetation and ecology (including birds); and
- socio-economic.

Noise, dust, traffic, waste generation, potential effects on hydrology, soils and geology and health and safety impacts will be addressed in the impact assessment and controlled through the implementation of standard environmental management measures that will be included in the draft EMP.

6.5 CUMULATIVE EFFECTS

Due to a substantial increase in the number of EIAs for renewable energy developments (solar and other renewable technologies) it is important to follow a precautionary approach in accordance with NEMA to ensure that cumulative impacts are addressed or avoided. The following positive and negative significant cumulative impacts could result due to the development of a number of solar energy facilities in close proximity to each other:

- visual intrusion;
- changes in (loss of) agricultural land;
- change in sense of place and character of the area;
- an increase in employment opportunities;
- an increase in electricity generated;
- an increase in the significance of ecological impacts; and
- an increase in the significance of geological and hydrological impacts.

There are a number of known proposed solar energy facilities planned in the Northern Cape, including the following:

- Ramphele 1 PV Solar Energy Facility, near Ritchie, two 50MW phases;
- Ramphele 2 PV Solar Energy Facility, near Ritchie, two 50MW phases;
- Ruimte PV Solar Power Plant, near Koffiefontein, (18 MW and 150MW);
- Solar Energy Facility, near Douglas (100 MW); and
- PV Power Plant at the Herbert Power substation, near Douglas (15MW).

The cumulative impacts of the proposed PV power facility and other solar energy facilities will be qualitatively assessed in the EIR as will the potential in-combination effect of the proposed PV power facility and other types of developments in the area.

It should however be noted that not all the solar power facilities presently under consideration by various developers will become operational. It is anticipated that not all proposed developments will be granted the relevant permits by the DEA as well as NERSA and Eskom due to the following reasons:

- there are limitations to the capacity of the existing Eskom grid;
- not all applications will receive positive environmental authorisation;
- there are stringent requirements to be met by applicants;
- not all proposed solar power facilities will be economically viable;
- not all solar power facilities will be able to reduce negative environmental impacts to acceptable levels or able to mitigate adequately; and
- not all solar power facilities will be successful in securing financial support.

7 PLAN OF STUDY FOR EIA

7.1 INTRODUCTION

The Scoping Phase represents an initial step of the EIA process. A key outcome of scoping includes the creation of Plan of Study for a full EIA. The EIA will then be carried out prior to approval and Environmental Authorisation of the proposed project. This section describes the Plan of Study for EIA as contemplated in regulation 28(1)(n) of R543 and sets out how the EIA will be conducted.

According to Government Notice R543 and Amendment R1159, Section 28(1)(n), a plan of study, must include the following:

a. *'a description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialised processes, and the manner in which such tasks will be undertaken;*
b. *an indication of the stages at which the competent authority will be consulted;*
c. *a description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and*
d. *particulars of the public participation process that will be conducted during the environmental impact assessment process'…*

This chapter serves as the Plan of Study and sets out the following:

- overview of activities to complete the EIA process;
- specialists studies;
- interaction with authorities;
- public participation activities;
- proposed methodology for assessing impacts; and
- provisional schedule for the EIA process.

7.2 OVERVIEW OF EIA TASKS

Following on from the Scoping Phase, the remainder of the EIA process will include the Specialist Studies and an Integration and Assessment Phase; in parallel with these activities the EIA team will continue to interact with the Authorities and implement the public participation process.

7.2.1 *Specialist Study Phase*

It is anticipated that all the specialist studies will be completed at the end of winter 2012. However, this timeframe is subject to the approval of this Scoping Report and Plan of Study for EIA by DEA. See *Section 7.2.2* below for further details.

7.2.2 *Integration and Assessment Phase*

The aim of this phase is to synthesise the findings of the specialist studies and any other relevant available information into a draft EIR (including a draft EMP). Information will be presented in a clear and understandable report which is easy to comment on and will aid decision-making.

The draft EIR and EMP will be published for a 40-day I&AP comment period. Registered I&APs will be notified of the release of the draft EIR. Copies of the full report will be made available at key locations and on the project website.

Comments received on the draft EIR and EMP will be collated and the EIA project team will provide a response. Comments and responses will be documented in a Comments and Responses Report which will be appended to the final EIR and submitted to DEA for decision-making.

Registered I&APs will be notified of the outcome of the EIA process once a decision (positive or negative) has been issued by DEA. The statutory appeal period will then follow.

The Integration and Assessment phase is anticipated to commence in July 2012. The commencement of this phase is, however, subject to the approval of the final Scoping Report, including the Plan of Study for the EIA.

7.2.3 *Interaction with Authorities*

The DEA will be consulted once the Scoping Report is submitted for approval, to ensure that all the requirements for Scoping have been met.

Once the Integration and Assessment phase of the EIA is underway, the next key interaction with the DEA will be the submission of the final EIR and EMP for authorisation. However, at the request of the DEA, the consultants would be willing to present the findings of the impact assessment and conduct a site visit, prior to decision-making.

The Northern Cape Department of Environment and Nature Conservation (DENC), the provincial commenting authority, will be engaged for their comments on the draft EIR. Ngwao Boswa Kapa Bokoni, the provincial heritage authority in the Northern Cape and SAHRA will be engaged for their comments on submissions by the Heritage Specialists and draft EIR.

7.2.4 *Public Participation Activities*

Public participation is an essential part of the EIA process. As such, a number of opportunities will exist for public involvement during the Integration and Assessment phase of the EIA. This will include the following:

- The draft EIR will be released for a 40-day public and authority review period.

- A notification letter will be sent to all registered I&APs on the project database. This letter will invite I&APs to comment on the draft EIR.
- I&APs will be notified of the Environmental Authorisation and the statutory appeal period through correspondence and via a newspaper advert.

7.3 SPECIALIST STUDIES

As discussed in *Section 6*, a number of potentially significant issues were identified during scoping. The following specialist studies will, therefore, be commissioned to further investigate these issues and any data gaps:

- archaeological, cultural heritage and palaeontology impact study;
- landscape and visual impact study;
- loss of agricultural land;
- vegetation and terrestrial ecology impact study (including birds); and
- socio-economic impact study.

During the Specialist Study phase, the appointed specialists will:

- gather relevant data to provide a description of the affected environment;
- assist the project team in assessing potential impacts (both negative impacts and benefits) according to a predefined assessment methodology (see *Section 7.4*); and
- suggest ways in which negative impacts could be mitigated and benefits enhanced.

Specialists who will be responsible for the specialist studies are identified in *Table 7.1*.

Table 7.1 Specialists

Specialist Study	Name and Organisation	Qualifications
Archaeological, Heritage and Palaeontology study	Tim Hart (ACO Associates *cc.*)	PhD Archaeology, University of Cape Town
	Lita Webley (ACO Associates *cc.*)	PhD Archaeology, University of Cape Town
Landscape and Visual	Bernard Oberholzer	BArch University of Cape Town; MLA, University of Pennsylvania
	Quinton Lawson	PrArch BArch, University of Natal
Botany and Terrestrial Ecology	Simon Todd	MSc, Cum Laude Conservation Biology University of Cape Town
Socio-economic	Lindsey Bungartz	BSocSci (Hons) Environmental Management

The terms of reference for each of the specialist studies is included in *Table 7.2* below. The results of the specialist studies will be integrated into the EIR during the Integration and Assessment Phase.

Table 7.2 Terms of Reference for Specialist Studies

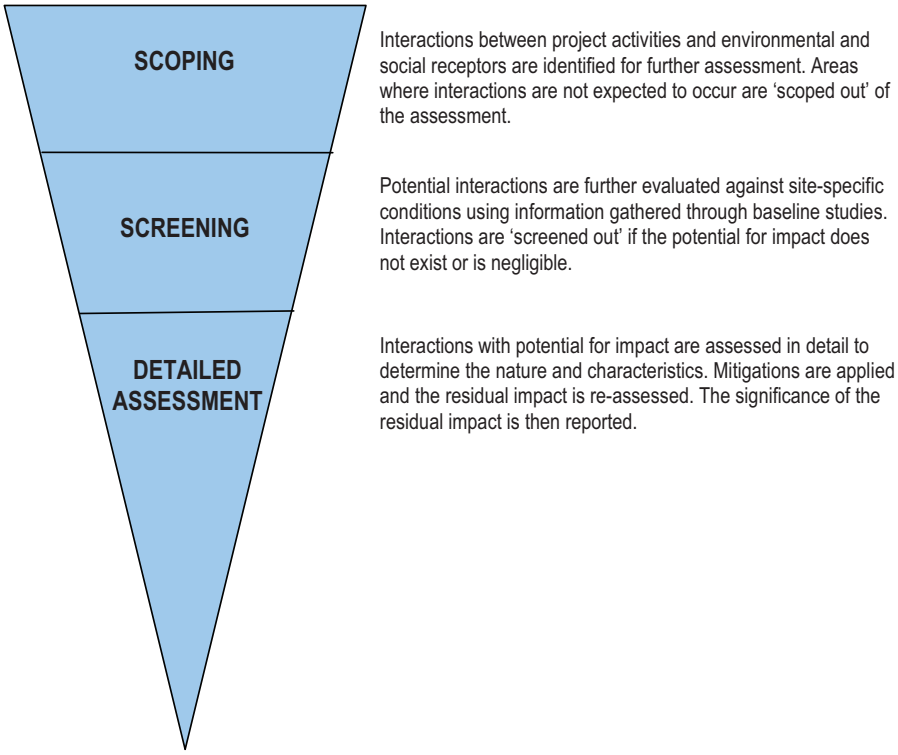
Specialist Study	Aim of the Study	Terms of Reference for specialist study
Archaeology, Cultural Heritage and Palaeontology	Determine the cultural heritage impacts associated with the PV power facility.	• Collect secondary data on the occurrence and distribution of heritage, archaeological and palaeontology sites in the study area. • Survey the project affected area and identify and describe sites of interest. • Explain how the different elements of the project may affect any archaeological, heritage and palaeontology sites within the study area. • Evaluate the potential impacts on sites of interest. • Describe mitigation/management measures that may be implemented to avoid or reduce any negative impacts on these sites and enhance benefits of the development. • Provide recommendations for any ongoing monitoring that may be necessary. • Liaison, submission and follow-up on all relevant permits, project applications and associated documents to the South African Heritage Resources Agency (SAHRA) and Ngwao Boswa Kapa Bokoni (Heritage Northern Cape), as required.
Landscape and Visual	Assess the visual impact associated with the proposed development	• Collate all available spatial data for at least a 10 km radius around the study area. • Develop a 3D model of the study area using available aerial photos and contour data. • Use of visual assessment tools to create a view shed analysis of the proposed development. The increase in view area to be calculated and shown. • Identify farms/neighbouring properties affected by the new viewsheds. • Identify sensitive receptors in the viewsheds including towns. • Where necessary, determine of the visual absorption capacity by means of graphic representation (photomontages) of the proposed development on 2D photographs taken from key locations. • Describe relevant and implementable mitigation measures to reduce, avoid, or minimise negative impacts and enhance positive impacts and recommendations.
Vegetation and Terrestrial Ecology (including birds)	Determine the impacts on vegetation and terrestrial ecology associated with the PV power facility.	• Undertake a desk and field-based investigation of the flora and fauna of the site (excluding avifauna), integrating on site information with available data from atlases, research reports and other published sources. • Map the ecological sensitivity of the site. • Assess the impacts on flora and fauna that are associated with the proposed development and describe relevant mitigation measures to reduce, avoid or minimise negative impacts to flora, fauna and habitats. • Provide recommendations for any ongoing monitoring that may be necessary.

Specialist Study	Aim of the Study	Terms of Reference for specialist study
Socio-economic	Assess the socio-economic impact associated with the proposed development	• Identify all relevant legislation, permits and standards that would apply to the development. • Provide a baseline description of the socio-economic environment that may be affected by the proposed project activities. • The baseline description will be derived from secondary data and primary data collection. • Identify and assess socio-economic impacts (direct, indirect and cumulative) that may result from the construction and operation phases of the project. • Recommend mitigation measures that address the local context and needs.
Agriculture	Determine the impacts on agriculture associated with the PV power facility.	• Undertake a desk and field-based investigation of the agricultural potential of the site, integrating on site information with available data from atlases, research reports and other published sources. • Map the agricultural potential of the site. • Assess the impacts on agriculture that are associated with the proposed development and describe relevant mitigation measures to reduce, avoid or minimise negative impacts to agriculture. • Provide recommendations for any ongoing monitoring that may be necessary.

7.4 IMPACT ASSESSMENT METHODOLOGY

The following diagram (*Figure 7.1*) describes the impact identification and assessment process through scoping, screening and detailed impact assessment. The methodology for detailed impact assessment is outlined in *Section 7.4.1* below.

Figure 7.1 Impact Assessment Process



7.4.1 *Detailed Assessment Methodology*

The purpose of impact assessment and mitigation is to identify and evaluate the significance of potential impacts (positive or negative) on identified receptors and resources according to defined assessment criteria; to develop and describe measures that will be taken to avoid or minimise any potential adverse effects and enhance potential benefits; and to report the significance of the residual impacts that remain following mitigation. Essentially, the assessment of impacts is an iterative process that considers four questions:

- **Prediction** - what will happen to the environment as a consequence of the project?
- **Evaluation** - does this impact matter? How important or significant is it?
- **Mitigation** – if it is significant can anything be done about it to reduce the significance?
- **Residual Impact** – is it still significant?

Impact Types and Definitions

An impact is any change to a resource or receptor brought about by the presence of a project component or by the execution of a project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment.

Impacts are described as a number of types as summarised in *Table 7.3*. Impacts are also described as *associated*, those that will occur, and *potential*, those that may occur.

Table 7.3 Impact Nature and Type

Nature or Type	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect	Impacts that result from other activities that are encouraged to happen as a consequence of the project (e.g. in-migration for employment placing a demand on resources).
Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the project.

Significance

Impacts are described in terms of '*significance*'. Significance is a function of the **magnitude** of the impact and the **likelihood** of the impact occurring. Impact magnitude (sometimes termed *severity*) is a function of the **extent, duration and intensity** of the impact. The criteria used to determine significance are summarised in *Table 7.4*. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in *Table 7.5*. For ease of review, the significance rating is colour-coded in the text according to *Table 7.6*.

Table 7.7 outlines the various definitions for significance of an impact.

Significance of an impact is qualified through a statement of the **degree of confidence**. Confidence in the prediction is a function of uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence is expressed as low, medium or high.

Table 7.4 Significance Criteria

Magnitude – the degree of change brought about in the environment	
Extent	**On-site –** impacts that are limited to the Site Area only. **Local –** impacts that affect an area in a radius of 20 km around the development area. **Regional –** impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystems. **National –** impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences. **Transboundary/International –** impacts that affect internationally important resources such as areas protected by international conventions.
Duration	**Temporary –** impacts are predicted to be of short duration and intermittent/occasional. **Short-term –** impacts that are predicted to last only for the duration of the construction period. **Long-term –** impacts that will continue for the life of the project, but ceases when the project stops operating. **Permanent –** impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the project lifetime.
Intensity (1)	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie habitats, species or communities).* **Negligible –** the impact on the environment is not detectable. **Low –** the impact affects the environment in such a way that natural functions and processes are not affected. **Medium –** where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High –** where natural functions or processes are altered to the extent that it will temporarily or permanently cease.
	SOCIO-ECONOMIC ENVIRONMENT: *Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the project.* **Negligible –** there is no perceptible change to people's way of life. **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High** - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.
Likelihood - the likelihood that an impact will occur	
Unlikely	The impact is unlikely to occur.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.

(1) The frequency of the activity causing the impact also has a bearing on the intensity of the impact, ie the more frequent the activity, the higher the intensity.

Table 7.5 Significance Rating Matrix

SIGNIFICANCE				
		LIKELIHOOD		
		Unlikely	**Likely**	**Definite**
MAGNITUDE	**Negligible**	Negligible	Negligible	Minor
	Low	Negligible	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

Table 7.6 Significance Colour Scale

Negative ratings	**Positive ratings**
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table 7.7 Significance Definitions

Significance definitions	
Negligible significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that medium impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the project.

Mitigation of Potential and Residual Impacts

For activities with significant impacts, the project would be required to identify suitable and practical mitigation measures and fully implement them. The implementation of the mitigation measures is ensured through the EMP. Once the mitigation is applied, each impact is re-evaluated, assuming that the mitigation measures are effectively applied, and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

7.5 PROJECT TIMING

Table 7.8 outlines the current estimated timeline of the assessment process going forward.

Table 7.8 Planned Schedule for Future Activities

Task	Date
Finalise Scoping Report and Plan of Study for EIA and submit to DEA	16 May 2012
Acceptance of Scoping Report received from DEA	End June 2012
Specialist studies	May – July 2012
Prepare Draft EIR and EMP	May – July 2012
Stakeholder Comment on Draft EIR and EMP	August – mid-September 2012
Finalise and submit EIR and EMP to DEA	Early October 2012

The Final Scoping Report will be submitted to the DEA for approval and made available to all I&APs for a 21-day comment period. On DEA acceptance of the Final Scoping Report, ERM will proceed with the Impact Assessment Integration Phase.

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