PROPOSED 75MW SWARTWATER PHOTOVOLTAIC SOLAR FACILITY ON DE PUT FARM NORTHERN CAPE PROVINCE

ENVIRONMENTAL IMPACT ASSESSMENT

DEA REF No. 14/12/16/3/3/2/564

DRAFT SCOPING REPORT

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ABBREVIATIONS AND ACRONYMS

AIA	Archaeological Impact Assessment
AEO	Annual Energy Output
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEDEA	The Eastern Cape Department of Economic Development and Environmental Affairs
DE	Department of Energy
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
GWh	Giga Watt Hour
HIA	Heritage Impact Assessment
I&APs	Interested & Affected Parties
IBA	Important Bird Area
IEM	Integrated Environmental Management
IRP	Integrated Resource Plan, which is an energy plan for South Africa for the next twenty years
NEMA	National Environmental Management Act
NERSA	National Energy Regulator of South Africa
NSBA	National Spatial Biodiversity Assessment
IPP	Independent Power Producer
PPP	Public Participation Process
PV	Photovoltaic
RAMSAR	The Convention on Wetlands of International Importance
REFIT	Renewable Energy Feed-In-Tariff
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SCADA	Supervisory Control and Data Acquisition
VIA	Visual Impact Assessment

1. INTRODUCTION

1.1. Background

AE-AMD Renewable Energy (Pty) Ltd (from here on 'the Applicant') has identified the need to establish a renewable energy generation facility which will be a Photovoltaic Solar Energy, with a total output capacity of approximately 75 MW (from here on 'the development'). The proposed solar energy facility is planned to be developed on Portions 7 and 9 of De Put Farm 73 located 18.2 Km South-South West of Petrusville Town in Northern Cape Province.

Due to the nature of the proposed development, the applicant is required to seek environmental authorization prior to its commencement. The developer or the applicant has appointed USK Environmental & Waste Engineering (Pty) Ltd to act as an Independent Environmental Assessment Practitioners (EAP) to complete the application for environmental authorization and to conduct the necessary and required studies to support the application, in a process referred to as the Environmental impact Assessment Process contemplated in terms of the National Environmental Management Act, Environmental Impact Assessment Regulation, 2010.

1.2. Purpose of this Report

The purpose of this document is to serve as a Draft Environmental Scoping Report for the development of the proposed 75 MW Swartwater Photovoltaic Solar energy facility. This report is intended to provide the details of the Scoping Phase of the Environmental Impact Assessment process. This report refers aims at identifying the potential issues and environmental aspects and potential impacts associated with the proposed development, and further define the scope and extent of studies which will be required to undertaken a full assessment of this impacts and potential mitigation measures. Further the report aims at describing the details of the public consultation process with key stakeholders that includes both government authorities and interested and affected parties (I&APs), to be undertaken as part of the scoping phase.

1.3. Structure of this Report

The Scoping Report generally consists of the following sections:

- **Introduction** The section provides background to the proposed project and the Environmental Impact Assessment Process.
- **Scoping Phase Methodology** This section describes the study approach used to gather all the information, assumptions, and limitations during the scoping phase. The chapter also includes the approach that will be considered during the EIA phase of the project.
- **Legal Requirements** This section outlines legislation, policies and guidelines applicable to the proposed development.
- **Public Participation Process** This section describes the methodology used for the Public Participation Process and the findings or results of this PPP.
- **Project Description and Alternatives** The chapter describes the environmental planning and design aspects of the project. The chapter also addresses design options that were considered in

order to ensure that the proposed project is technically feasible without significantly impacting on the biophysical and socio-economic environment.

- **Description of the Affected Environment** This chapter describes the key elements of the socio-economic and biophysical environment. The chapter will also meant to incorporate any findings of any studies undertaken during the Scoping phase and issues and concerns raised during the public participation process.
- **Identification of Potential Environmental Impacts** This section is a description of the potential environmental impacts of the upgraded wastewater treatment works based on the field assessment and specialist findings. A summary of the most important findings of the Scoping phase will be provided.
- **Plan of Study of EIA** This Chapter has been compiled in accordance with Regulations 28 (n) of Government Notice No R.543 of 2010. The Plan of Study for EIA sets out the proposed approach to be followed during the Environmental Impact Assessment phase. This will include the terms of reference for all specialists and the detailed description of the methodology that will be used to assess all identified impacts, and also the details of the consultation process both with the public and the regulating authorities.
- **Conclusion and Recommendations** This chapter summarises the key findings and conclusions drawn from the scoping phase, and further provides recommendations for the phases to follow.

1.4. Details of the Project Applicant

The Applicant for this development is AE-AMD Renewable Energy (Pty) Ltd, which is a South African private company active in the development and implementation of renewable energy projects. The applicant has undertaken various projects including Solar PV Energy and Wind Energy Projects in various parts of South Africa. AE-AMD Renewable Energy (Pty) Ltd has established strategic technical partnerships with leading renewable energy international corporation in Spain to ensure the success and sustainability of all their projects and that the projects under development are implemented in line with international best practice.

The Contact Details of the Applicant are provided below:

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1.5. Details of the Environmental Assessment Practitioner

The Environmental Assessment Practitioners (EAP) for this application is the USK Environmental & Waste Engineering (Pty) Ltd which is a South African Professional Consulting firm, with a team of professionals specializing in a number of environmental science and environmental engineering fields including Environmental Management, Environmental Management Planning, Water Quality Management, Integrated Waste Management, Pollution Monitoring, Environmental Toxicology, Ecological Studies, and Air Quality Monitoring and Geographical Information Systems and Remote Sensing, among others. USK Consulting has emerged to become a highly professional consulting firm with sought after and credible consultants both locally and internationally. The following provides the contact details of USK Consulting and the EAP team members:

Company Name: **USK Consulting (Environmental & Waste) cc**

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1.5.1. EAP Team Leader

The following members from USK Consulting constitute the consulting team of the Environmental Assessment Practitioners: (Further details can be found in attached individual Curriculum Vitae).

Name	Mr. Steve Kitumba Kalule
Qualifications/Studies	PhD. Environmental Toxicology (Current) University of North West (Potchefstroom) MSc. Environmental Toxicology & Pollution Monitoring (University of Ulster, UK)
Expertise	Environmental Impact Assessment, Ecological Risk Assessment, Toxicology, Waste Management, Water and Air Pollution Monitoring.
Experience	15 Years
Professional Affiliations	Institute of Environmental Sciences (IES) UK – Member No. 2067 Institute of Waste Management of Southern Africa – Chairman Eastern Cape Society of Environmental Toxicology and Chemistry – Member International Association of Impact Assessment - Member

2. NEED AND DESIRABILITY OF THE PROJECT

2.1. Introduction

The South African National as well as the Northern Cape Provincial government policy provides for the encouragement of energy generation from renewable sources in order to reduce the harmful consequences of fossil fuel usage and to meet the future demand for energy using diverse and secure supplies. This section provides a motivation for the development, by examining the need and desirability of the proposed Swartwater Solar Facility project, at local, provincial and national scale.

2.2. Global Need for Renewable Energy

Global climate change has been the subject of extensive research for decades. As computational models have improved, so has the understanding of the processes, which bring about global climate change, and its likely consequences. Scientists worldwide hypothesize that global warming is occurring, and that greenhouse gas emissions, including emissions from coal fired power stations, are a major contributor. The Intergovernmental Panel on Climate Change (IPCC), an internationally recognized scientific body on climate change, concluded in its Fourth Assessment Report that climate change is unequivocally occurring and is due in large part to human activity (IPCC, 2007). In 2004, an international study on the effects of climate change showed that well over a million species could be potentially threatened with extinction (Thomas et al., 2004). The study clearly stated that climate change is the biggest new extinction threat. It also found that 15- 20% of all land species could potentially be saved from extinction if minimum, rather than maximum, anticipated climate warming occurs. This underlies the critical importance of rapid implementation of technologies to decrease greenhouse gas emissions and hence reduce climate warming. Renewable Sources such including Solar Energy positively contribute the reduction of climate change.

2.3. National and Local Need for Renewable Energy

Energy is critical to virtually every aspect of the economic and social development of South Africa. Using renewable energy sources for electricity generation in South Africa would have tangible environmental benefits, given that 93% of electricity generation is currently based on coal (NER, 2000b). In 2001, Eskom power stations burned 94.1 million tons of coal and emitted 169.3 million tons CO_2, 2 154 tons N_2O, 1.5 million tons SO_2, 684 000 tons NO_x and 59 640 tons of particulates (Eskom, 2001). But how should ‘renewable electricity’ (meaning here electricity generated from renewable energy sources) be promoted, given the associated higher initial capital costs as well as the need to extend access to affordable energy services? Any energy source or technology must contribute to basic energy service needs—lighting, space heating, water heating, cooking and productive use. Renewable electricity that does not deliver services like cooking or productive use is limited in its contribution to sustainable livelihoods. Where technologies lock communities into lower levels of service, they should not be imposed on the poor. Environmentally sound solutions must also pass the test of cost-effectiveness.

The South Africa Government has stated that they remain committed to addressing the issues surrounding renewable energy and global warming and aims to draw 2% of energy needs from renewable energy sources by 2025. The Swartwater Solar Project will be a positive step forward to meeting these provincial strategic objectives and targets.

2.4. Purpose of the Project

The objective of the Swartwater Solar Project Solar Facility is to contribute towards National and Provincial target for renewable energy generation, in addition to South Africa's requirement to reduce greenhouse gas emissions, which contribute toward global climate change. Further to the above, the Swartwater Solar Project Solar Facility is being developed with the intention of promoting social and economic development in the Northern Cape.

3. DESCRIPTION OF THE PROPOSED PROJECT

This section of the Environmental Scoping Report summarizes the Swartwater Solar Project Solar Energy Facility proposal and provides a detailed description of all project components and activities throughout the construction, operation, and decommissioning phases of the project.

3.1. Project Location

The proposed development site of the Swartwater Solar Energy Facility is located in the Renosterburg Local Municipality in the Northern Cape Province, South Africa. The project site is Portions 7 and 9 of De Put Farm located approximately 18.2 Km South-South West of Petrusville. The Farm is situated approximately 19Km just off the Graspan gravel road which turns off the R48 which is 1.2Km South of Petrusville, Northern Cape. The central coordinates of the proposed development Site is 261537.84 m E 6654994.93 m S (UTM). Several site photographs have been taken at various locations around the Project Site, and can be seen in the Photo plate in this report. The figures below show the photos taken at various locations near and on the proposed site of the Solar PV project.

Figure 1 Floor of the Proposed Site in the mid ground facing North

Figure 2 180 Degree Panoramic view of the Floor of the Proposed Site from East, South to West

Figure 3 180 Degree Panoramic view of the Floor of the Proposed Site from West, North to East

Figure 4 Panoramic view of the Floor of the Proposed Site facing South

Figure 5 Panoramic view of the Floor of the Proposed Site facing East

Figure 6 Panoramic view of the Floor of the Proposed Site facing West

Figure 7 Panoramic view of the Floor of the Proposed Site facing East

3.2. Photovoltaic (PV) Solar Energy Facilities

3.2.1. Solar Energy

Solar energy represents an inexhaustible clean energy source that can be tapped and converted into electric power using various technologies such as the photovoltaic (PV) technology. Solar is indeed the energy force that sustains life on Earth for all plants, animals, and people. The Earth is situated at the perfect distance and orbit from the Sun and is essentially a giant solar collector that receives radiant energy from the Sun in the form of electromagnetic radiation in the order of 1,000 W/m^2, although availability varies with location on earth and time of year (figure 5 below shows the solar radiation distribution Across South Africa).

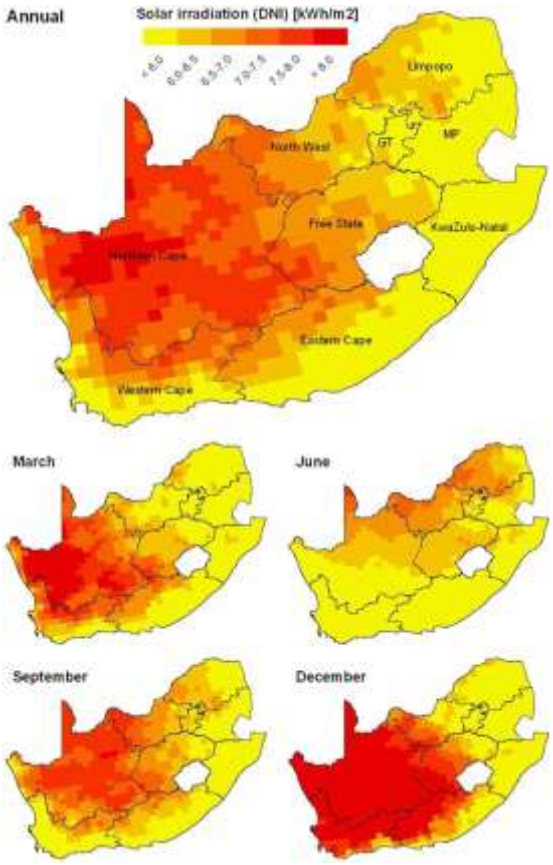


Figure 8 Annual and Monthly Solar Radiation Map of South Africa (Thomas Fluri, 2009)

One can deduce from the above solar radiation map, the Northern Cape falls within the highest potential areas for solar energy in South Africa with estimate 7.0 – 8 kWh/m^2, and it offers a very high potential for solar energy concentration using sun tracking Photovoltaic (PV) panels. Solar energy can be converted through chemical (e.g., photosynthesis), thermal, or electrical (i.e., PV) processes. Capturing solar energy typically requires equipment with a relatively high initial capital cost. However, over the lifetime of the solar equipment, these systems can prove to be cost competitive, especially because there are no recurring fuel costs, as compared to conventional energy technologies.

3.2.2. Photovoltaic Systems

Solar electric power, or PV systems, is a cost-effective and viable solution to supply electricity for locations off the conventional electrical grid. PV power systems have been utilized almost everywhere. However, the higher capital cost of PV means it is most cost effective for remote sites where other, more conventional options are not competitive. There are often misperceptions regarding what constitute a good candidate PV application and site; thus, careful site consideration is necessary to eliminate unsuitable locations. For instance, projects that require large amounts of power are generally nonstarters for PV consideration. PV systems have both advantages and disadvantages that should be carefully considered by the project implementer and the end user.

PV project success is directly related to a clear knowledge of site conditions and resources, as well as an understanding of PV capabilities and limitations. What makes a site adequate for solar energy? What differences are there in resources from site to site? What is the approximate system cost?

- Solar cell. The PV cell is the component responsible for converting light to electricity. Some materials (silicon is the most common) produce a PV effect, where sunlight frees electrons striking the silicon material. The freed electrons cannot return to the positively charged sites ("holes") without flowing through an external circuit, thus generating current. Solar cells are designed to absorb as much light as possible and are interconnected in series and parallel electrical connections to produce desired voltages and currents.
- PV module. A PV module is composed of interconnected solar cells that are encapsulated between a glass cover and weatherproof backing. The modules are typically framed in aluminium frames suitable for mounting. Modules are rated to UL1703 and IEC 1215 standards.
- PV array. PV modules are connected in series and parallel to form an array of modules, thus increasing total available power output to the needed voltage and current for a particular application. PV array may either be fixed, sun-tracking with one axis of rotation, or sun-tracking with two axes of rotation.

PV modules are rated by their total power output, or peak Watts. A peak Watt is the amount of power output a PV module produces at STC of a module operating temperature of 25°C in full noontime sunshine (irradiance) of 1,000 W/m^2. Keep in mind that modules often operate at much hotter temperatures than 25°C, thus reducing crystalline module operating voltage and power by about 0.5% for every 1°C hotter. Therefore, a 100 W module operating at 45°C (20° hotter than STC, yielding a 10% power drop) would actually produce about 90 W.

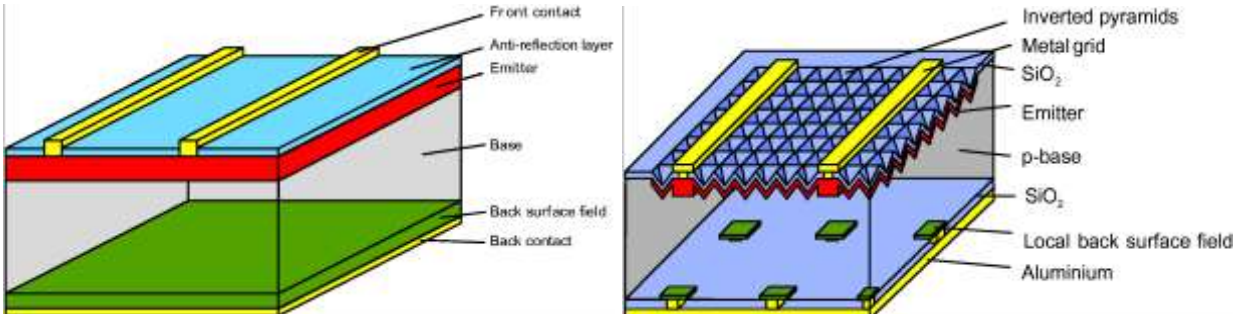


Figure 9 Photovoltaic cell structures

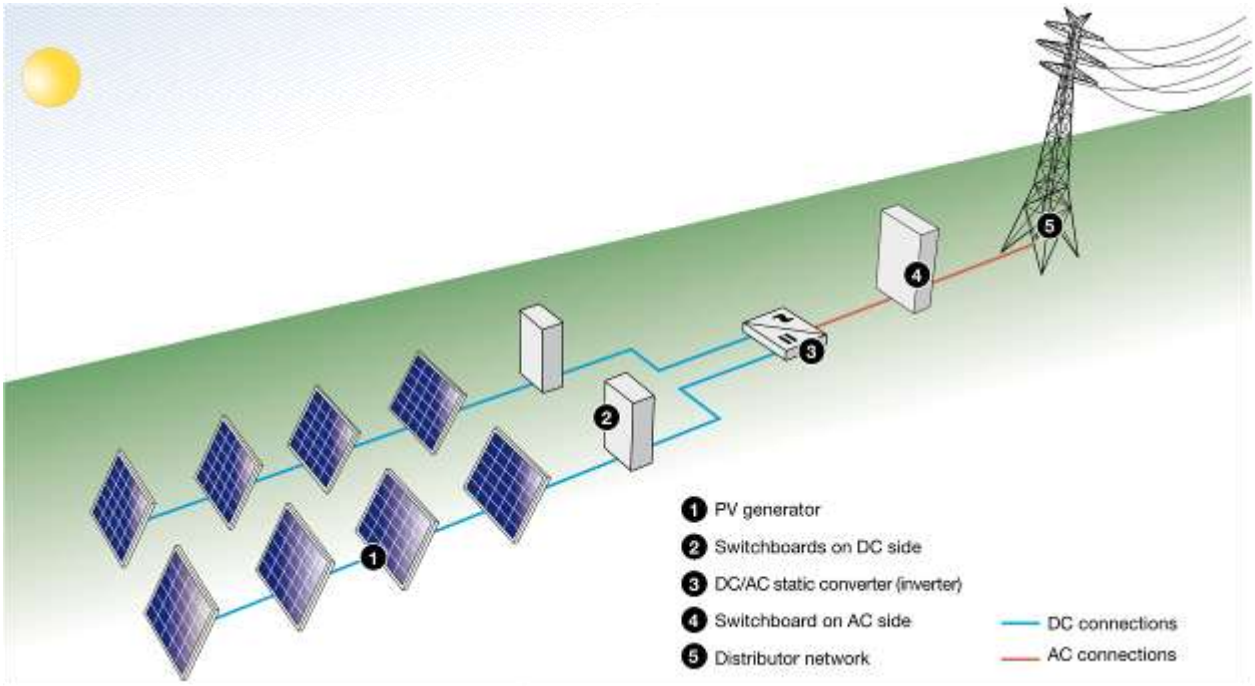


Figure 10 Schematic of Solar PV facility and connection to the grid

3.3. Project Components

In Summary the proposed development site of the Swartwater Solar Project Solar Energy Facility will be composed of the following infrastructure:

• General Layout Design • Foundations • Structures • Fixed Or Rack Structures • Single-Axi Tracker • PV Modules • Inverters • Concentrator Boxes • Transformation Centre • Distribution Centre • Electrical Reticulation	• Lightining Protection System • Auxilary Power Supply • Emergency Power Supply • Monitoring & Control Systems • Met Stations • Site Preparation • Trenches • Access and Internal Roads • Drainage • Balanced Cut, Borrow, Fill & Spoil • Buildings & Services • Hardstand Areas • Perimeter Fencing • Security System • Water for Construction and Operational Phase

These components and associated infrastructure are described in details in this chapter.

3.3.1. Specifications of the Swartwater Solar Energy Converters

The proposed PV plant at the Swartwater energy facility will convert the incident solar energy into direct current (DC) electricity by means of photovoltaic modules. The electricity is transferred to DC/AC inverters to convert it to alternating current (AC). The inverters are matched to the selected PV module technology, and in turn are connected to a step-up transformer in order to raise the voltage up to the grid tie-in requirements.

The Engineering, Procurement and Construction will be carried out by an EPC Contractor in accordance with good engineering practice, with due diligence, care and professionalism. The design of the facility and the selection of equipment will be tailored for the specific site conditions, such as climate, ground conditions etc.

Photovoltaic power plants have a wide range of technologies that can be considered for incorporation into the plant. During the EIA and bid process the developer will put out a Request for Offers (RFO) from credible EPC Contractors who will make proposals with respect to the technology to be used and possible equipment suppliers for the PV plant. These proposals include the PV module manufacturer, the capacity of the modules, the support structure or tracker type, and manufacturer, the inverter type, etc. Some of these alternatives are discussed in more detail below.

The solar PV industry is a rapidly developing industry and the advances in the general efficiencies of the technology and also the reduction of production costs are such that it would not be feasible to commit to specific technologies and manufacturers at this stage.

The average bid price for solar PV projects decreased from R2.75/kWh to R1.75/kWh between Round 1 in October 2011 and Round 2 in March 2012. The bid prices for Round 3 in August 2013 have been capped at R1.40/kWh.

Therefore the project description will be in generic terms and will not specify specific brands and capacities.

3.3.2. General Layout Design Criteria

The choice of the technology or more specifically, the PV module and tracker or rack structure is the chief determinant in the layout of the PV plant. Fixed rack structures, single and two axis trackers all have different spatial requirements.

An optimised layout or spatial arrangement of the solar field is prepared based on the performance criteria and spatial requirements of the preferred equipment choices above taking into account the further design criteria listed below.

- General site topography,
- 16 m from any power lines,
- 95 m from the centre of public roads (or a relaxation to a lesser distance, usually 60m)

- 16 m to any Telkom line,
- A minimum distance of 10 m to the perimeter fence to prevent theft and avoid shadows cast by the fence
- Internal and perimeter service roads of 3m surface width and 5 m reserve width
- A main access road of 10 m reserve width

3.3.3. Foundations

A detailed geotechnical study will be carried out in order to provide data for the selection of the foundation. Depending on the structure or tracker that is selected, the following foundation options may be considered.

- Mass concrete block foundation
- Ground screw foundation
- Concrete pile foundation
- Vibratory driven steel pile foundation

For fixed or rack structures, either driven steel piles or small concrete footings are cast in the ground for the foundations. These concrete foundations are typically of the same size as for small buildings.
The preferred technology for trackers is the vibratory driven steel pile foundation. If the ground conditions the piles are either directly driven into the ground in suitable soils or driven into backfilled pre-drilled holes in rocky or hard areas. Depending on the ground conditions a concrete pile might also be used.

3.3.4. Structures

In order to support the PV modules, a steel structure must be used. There are different options which will be considered: a fixed or rack structure, a 1-axis tracker (horizontal, vertical or polar axis) and a 2-axis tracker. The current trend is towards rack structures or possibly horizontal single axis trackers because of the superior production rates and cost effectiveness.
There are numerous rack and tracker manufacturers in the market and the system chosen will depend on the proposals by the EPC Contractors.
The materials commonly used in support and tracker structures are:

- Galvanized steel
- Stainless steel
- Anodized aluminium

3.3.5. Fixed or Rack Structures

A typical rack or fixed structure will have two rows of 20 modules (2 strings). The modules are placed in portrait arrangement. The foundation technology is usually a direct-driven (rammed) installation, with a ramming depth subject to the soil characteristics, or reinforced concrete strip footings.

Figure 11 Rank/Fixed Solar PVs

The design of the fittings for fixing the modules to the rack structures will enable thermal expansion of the metal without transferring mechanical loads that could affect the integrity of the modules. The structure will probably have anti-theft bolts.

3.3.6. Single-Axi Tracker

With a typical horizontal single-axis tracker the PV modules are attached to beams on the rotating structure. A number of these trackers are placed adjacent and parallel to each other and driven by a common rotation mechanism. This allows for a modular design with each module having a single central motor and a number of trackers. This simplifies design and allows for an extremely efficient use of space. The system produces more output than rack structures yet still has extremely low energy consumption. Precision electronics with GPS input and proprietary positioning algorithms ensure optimum angle is controlled at all times.

Figure 12 STI Norland Trackers example

Figure 13 Oliveza Spain Example

3.3.7. Photovoltaic Modules

There are various types of PV modules defined according to the materials used:

- Si-Monocrystalline
- Si-Polycrystalline
- Thin Film
- High Concentrated

There are also a wide range of PV module manufacturers in the market. Currently the trend for utility scale facilities such as this is towards polycrystalline module technology.

In the Independent Power Producer Procurement Programme an important bid criteria is local content and the use of locally manufactured or assembled PV modules is promoted to help the local economy, local job creation and the local communities. The current pricing of the local PV modules however means that imported PV modules are more likely to be used.

The Contractor establishes rigorous quality control procedures for the PV modules suppliers. These procedures are applied to the origin of the supply, as well as during the supply.

See the section below on recycling the PV modules on re-powering or decommissioning the plant.

3.3.8. Inverters

There are various types of inverters defined according to their technology:

The inverter will be selected on the basis of making the most of its rated power according to the manufacturer specifications and the power to be installed in each site. The choice of inverter depends on the performance of the PV module chosen (type and model).

3.3.9. Concentrator Boxes

The concentrator boxes are outdoor switchgear boxes or cabinets where the electrical wires from the tracker or rack group are collected. The concentrator boxes are designed for outdoor conditions and are mounted on a concrete base.

3.3.10. Transformation Centre

The transformation centre will be a concrete or steel prefabricated structure built to house the transformer and the associated protection devices. In the transformer, voltage level will be transformed from 0.38 kV to 132 kV.

3.3.11. Distribution Centre

The distribution centre is where all the medium voltage lines coming from the various transformers are collected. The distribution centre is housed in a pre-fabricated or a steel structure and a MV line runs from here to the Eskom substation.

3.3.12. Electrical Reticulation

- The electrical reticulation within the PV plant, from the trackers or racks through the inverters and transformers to the distribution centre will all be underground. Typically it is either armoured cable in suitable granular bedding material buried 600mm below ground level or the cables are not armoured and are in conduits at the same depth.
- The electrical reticulation will comprise of a Direct Current (DC) component from the PV modules to the inverters and an Alternating Current (AC) component from the inverters via the concentrator boxes and transformers to the Eskom connection.
- Typically the DC cabling is based on pre-assembled harnesses from each string-end connection up to the concentrator boxes. The harnesses incorporate a first-level over-current protection by means of properly sized line- fuses. The DC cable will be in full compliance with IEC and SANS standards, with single layer of XLP insulation, 90ºC temperature rating (wet or dry), suited for direct burial installation, rated for 1kV and UV resistant.
- Typically, the cables will be sized to guarantee a maximum 1.5% voltage drop between PV modules and inverters.
- Typically the AC-MV cable will be in full compliance with IEC, SANS and NRS Standards, with stranded aluminum conductor, triple extruded insulation system and high dielectric strength 22kV insulation. The MV cables will be suited for direct burial, for operation at 105°C continuous, 140°C in emergency and 250°C in short-circuit.
- The connection to the Eskom grid will be from the distribution centre to a new sub-station built within the plant and then a direct connection looping into the Eskom power-lines.
- This connection or evacuation line will be an overhead 132kV line.

3.3.13. Lightning Protection

To protect the PV plant, equipment and personnel from lightning strikes a lightning protection system composed of masts and surges arresters will be installed. This system will be designed by a specialist and will comply with the South African laws and standards.

Although current lightening protection designs only allow for low height protection on the individual structures, provision will be made in the applications for 15m high conductor masts.

3.3.14. Auxiliary Power Supply

The PV plant requires a continuous power supply for the operation of the plant. This is for the plant monitoring and control systems, the perimeter and security systems, lights and air-conditioning etc for the buildings. Also if trackers are used, a small supply is required for the operation for the trackers.

The most cost effective and efficient source for the auxiliary power supply is usually directly from the Eskom supply, however since there is no low voltage Eskom reticulation nearby, a self-sufficient renewable energy source, probably in the form of PV modules, battery banks and inverters will be put in place.

3.3.15. Emergency Power Supply

In order to ensure the continuous operation of the monitoring system and security a backup diesel generator system, with at least 2 hours of autonomy, is usually installed.

3.3.16. Monitoring and Control System

- A SCADA (Supervisory Control And Data Acquisition) system will be installed. The primary purpose of SCADA is to monitor, control and alarm the plant or area operating systems from a central location. While override control is possible, it is infrequently utilized.
- There are three main components of a SCADA system; the various RTU's (Remote Telemetry Units), the communications and an HMI (Human Machine Interface).
- Each RTU effectively collects information at a site, such as from the inverters or met station, while communications bring that information from the various plant or area RTU sites to a central location, and occasionally returns instructions to the RTU.
- The HMI displays this information in an easily understood graphics form, archives the data received, transmits alarms and permits operator control as required. The HMI is essentially a PC system running powerful graphic and alarm software programs.
- Communication within a plant will be by data cable, wire or fibre-optic, while regional systems most commonly utilize radio or the internet. The real time information can be monitored remotely, typically by the O&M Company and the plant owners etc.

3.3.17. Meteorological Station

There will be a number of meteorological stations installed on the site in order provide adequate meteorological data to evaluate the PV plant performance. The typical meteorological station will include all or some of the following items:

- Lattice structure 3m high for the support of the systems
- Pyranometer for tilted radiation.
- horizontal pyranometer for global radiation

- Ambient temperature sensor with natural ventilation antiradiant shield.
- Anemometer at 5m height.
- A vane to measure the wind direction.
- Module temperature sensor.
- Humidity sensor.
- Data logger.
- GSM/GPRS modem.
- UPS or non-stop power supply system.

3.4. Supporting Infrastructure

3.4.1. Access Roads

The Solar Energy Facility will require a main access road to the facility, and a network of Internal access roads will interlink each turbine, and solar photovoltaic module and to the main control hub and administration office. The main access road will remain as the existing site access off the Graspan road, which is in a fairly good condition and wide enough. However the site will require internal roads, which should be approximately 5 meters wide in order to accommodate turbine deliveries and site construction vehicles. Although there are already some existing access routes on the farm, these will need to be upgraded and constructed to a grade suitable for use by heavy delivery and maintenance vehicles and machinery. See the SDP (**under appendices**) for the internal road network and access to and within site of the proposed solar energy facility.

Figure 14 Graspan Road Turn off on the R48 from Petrusville

Figure 15 Gravel Road to the site off the R48 from Petrusville with cattle grids along the road

Figure 16 Gravel Road to the site off the R48 from Petrusville with cattle grids along the road

3.4.2. Power Transmission Lines

The internal transmission lines from the PV modules from will be buried underground cables and earthing (grounding) and in cable trenches. The trenches will where possible be run along the internal access road reverses and watercourse crossings as show in Site Development Plan Map. All energy generated would then be exported into the existing local grid at the existing ESKOM substation adjacent to the property. The authorization for connection into the grid at this substation shall be subject to ESKOM's standard connection assessment and agreements between ESKOM and the applicant.

3.4.3. Site Office and Control Room

The buildings and facilities needed to service a PV plant are; a control room (20m^2), a general office (40 m^2), access control and security building (20m^2), ablution facilities and kitchen area (20 m^2), a small workshop (40 m^2) and a store of 300 to 400 m^2.

There is space allocated in the PV plant layout for the buildings near the entrance to the site.

One option is to build a farm type shed of approximately 480 m^2 (40m x 12m) with the control room and offices etc. inside the building. However, given that the electricity generating license has a 20 year term the trend is to provide temporary buildings such as Park-homes or containers.

Services for the buildings are provided as follows.

- Electricity will come from the Eskom sub-station.
- The control room and the office will have air-conditioning
- A sceptic tank system will be used for the toilets. Alternatively, Enviro-loo toilets will be used. These toilets are used in a number of National Parks and Nature Reserves. The toilets do not require a water supply and operate by separating the solid and water waste and then drying the waste by evaporation. The dry solids are removed and can safely be spread as compost in the field.
- The source for the small amount of potable water required for use by the site personnel will need to be determined during the planning process. See below.

Should the available water need treatment then the appropriate equipment will be used. Note that the amount of potable water required is well under the limits required to trigger water use applications,

however depending on the source of the water the type of use (Industrial) might trigger an application for a water use license.

3.4.4. Substation

The electrical energy generated will be fed into the ESKOM at the existing power substation located outside of the Southwestern Boundary of the development site (see locality map and site development plan in Appendix 1).

3.4.5. Water Supply

3.4.6. Water usage during construction

- The temporary water requirement for the construction stage of the PV plant is mainly for the production of concrete for the structure and tracker bases. About 360lt of water is used for each m^3 of concrete. This is about 180lt for the concrete mix and about the same again for the general process, construction and dust control etc. How much concrete and hence water is required depends largely on the technology used and the foundation design.
- Based on the worst case requirements of mass concrete foundations about 9Ml would be needed for the construction stage of a 75MW solar PV plant. This equates to an average draw down rate of about 80kl per day during the construction period. Initial indications are that a vibratory driven pile foundation or ground screw types of foundations will be able to be used. In this case the amount of water needed for construction phase would be about 1.270Ml.
- Possible sources for this water are to be investigated and the relevant authorities will be approached during the EIA process.

3.4.6.1. Water usage during operations

- A PV plant does not require much water for operation. The only requirements are water for the domestic needs of the security and operational personnel and for the cleaning of the PV panels.
- Possible sources for this water are to be investigated and the relevant authorities will be approached during the planning stage, concurrent to the EIA process. Noting that the majority of the water is required for cleaning, the water could be obtained from the Orange River. Alternatively water could be procured from the Local Authority and brought to site by a vehicle equipped especially for the cleaning operation. The water for the "domestic" use could similarly be transported to site.
- The water requirements for the operational phase of a 75MW PV plant will be about 3200kl per annum. This equates to about 8700lt/day.
- Possible sources for this water are to be investigated and the relevant authorities will be approached during the planning stage, concurrent to the EIA process.

3.4.7. Sanitation

There is existing sanitation in form of a conservancy tank on the site and this will be sufficient as a form of sanitation on the site during both construction and operation especially since the operation is not a labour intensive one. It is not anticipated that the number of people on site will be more than 5 persons on any given day normal operational day. Chemical toilets will be provided for construction workers during the construction phase,

3.4.8. Stormwater and Drainage

The development is not likely to significantly increase stormwater runoff, however in areas which will be surfaced especially the roads, stormwater drains will be constructed to allow surface run-off to flow in the natural watercourses and as much as possible not alter or interfere any natural watercourses or surface water flow direction.

The drainage system proposed will be a surface management system based on not collecting storm-water but rather spreading or distributing it over the site to soak away or drain slowly similarly to the normal pre-development flows. This avoids the soil erosion and downstream flooding problems normally associated with the concentrated flows.

3.4.9. Access Control, Security and Fencing

- The perimeter, access points and general site will be monitored by CCTV cameras infrared / night vision technology and passive intrusion detection systems. There will be security lighting which will be linked to the passive intrusion detection systems so will not be on all night.
- The perimeter, access points and general site will be monitored by CCTV cameras infrared / night vision technology and passive intrusion detection systems. There will be security lighting which will be linked to the passive intrusion detection systems so will not be on all night.
- Given the high material values and risk of theft associated with PV panels and electrical cabling it is imperative that the perimeter fences and security systems get installed and commissioned as soon as is practical. This is especially so before the reticulation is operational, when the materials are less easy to steal.
- The process will be to first fence off a delivery, storage and processing area within the site as a start and then to erect the perimeter fence and security. This will allow the initial construction start up activities to begin earlier. The proposed perimeter fence is 2.4 m weld-mesh or wire and netting fence which is electrified or a double barrier consisting of two 2.4m high electric fences with only electric strands placed about 2 or more metres apart. The electrification will be non-lethal.
- A single 6m automated sliding gate will be provided for vehicular access and possibly a secondary or emergency manual gate. No pedestrian gates to be provided.

3.5. Construction Phase

3.5.1. Construction Programme

The construction of the proposed Solar Energy Facility will take in a phased approach. The project is anticipated to take approximately 9 months to complete. Once the construction has been completed all the temporary site camps and works will be removed from the site and vast majority the land will be restored to its original condition to the greatest degree possible before the operational phase is kicked off. Following is a summary of the activities, which will occur during the construction of the project:

- Surveying and site demarcation;
- Erection site notice boards, fences, and entrance gates and access controls;
- Foundations and soil testing;
- Installation of perimeter fence
- Establishment of Site camps;
- Construction of temporary staging area (laydown) and employee parking lots;
- Delivery of construction materials and equipment;
- Erection of permanent meteorological monitoring mast;
- Construction of drainage crossings;
- Construction of internal road networks and improvement of existing roads;
- Delivery of equipment and materials;
- Installation of collection system cable beside internal site roads;
- Foundation excavation;
- Construction of foundations and piles;
- Assembly of trackers or racks;
- Moving of the assembled trackers or racks to their final position
- Construction of underground electrical reticulation;
- Installation of lightning protection system
- PV Convertor electrical interconnections;
- Interconnection of electrical distribution system;
- Construction of buildings
- Installation of security system
- Commissioning of the systems;
- Commissioning tests; and
- Removal of all temporary works and restoration of the site.

3.5.2. Surveying and Demarcation of site

- Prior to the commencement of roads, foundations and PV erection, a number of enabling works need to be undertaken. These will include final Engineering design and a geotechnical assessment for the construction works to be undertaken on the site.
- This activity will also include the demarcation of the site and designating the various key construction areas, access roads, site works, site camps etc.
- The following areas have been defined for construction purposes and are indicated on the concept Site Development Plan:
  - Site Camps
  - Lay down area
  - Assembly area
  - Spoil heaps and borrow pit area

3.5.3. Construction of Site Camps and Parking lot

- A temporary site camp or construction compound and associated parking will be set up on the site. The site camp will be used for the staging of materials and equipment, and will also serves as a gathering point for safety talks and will house office facilities for the staff involved in constructing the Project.
- The site including the parking area will be approximately 75 meters by 100 meters.

3.5.4. Lay-down Areas

- Lay down areas are areas needed for the reception of different materials such as PV modules, rack or tracker components, motors, gears, electrical devices, conduits for wires, transformers, switchgears, prefabricated structures etc.
- Part of the Project Location will be graded and used as a construction staging/laydown area as shown in the Site Development Plan.
- Establishment of the laydown area will involve the removal of vegetation and the stripping and stockpiling of topsoil.
- The laydown area will be decommissioned and all temporary facilities removed when construction is completed, although portions of the area may be retained to provide vehicle parking for maintenance personnel and equipment storage.
- The lay-down Provision must be made for the safe working area, parking excavation and delivery vehicles etc.

3.5.5. Assembly Areas

It is an area proposed for a safe and fast assembly of the racks or trackers. There, needed materials are laid within the assembly area in order to streamline the assembly process. Once the rack or tracker is preassembled, a rough terrain vehicle will transport the tracker to its final position to finish the process (wiring connection, gear mounting etc.).

3.5.6. Site Clearing

- Owing to the relatively open or expansive nature of the PV plant and hence the construction process, no specific service or haul roads are envisaged.
- The site will be sufficiently cleared to allow access for the excavation equipment and the rough terrain vehicles that will deliver the site assembled PV rack or trackers structures to their positions.
- The development footprint portion of the site needed will be cleared, grubbed and graded by means of the necessary cuts and fills in order to condition the terrain to the maximum slopes allowed for buildings, roads and racks.
- Given the flat nature of the site there is very little cut and fill envisaged.
- Vegetative ground cover reduces dust which influences the PV panel efficiency. The re-growth of the ground cover or rehabilitation is thus important to the PV plant. It thus makes sense to minimise the disruption of the existing vegetative ground cover, however in general the entire site will be trampled and a vegetation rehabilitation measures will need to be implemented.

3.5.7. Construction of Drainage Crossings

- If drainage crossings will be required, Box culverts will be constructed over these drainage watercourses in order to create the crossings.
- The crossings will be constructed to the standard that they can withstand larger, heavier loads. The locations of the drainage crossings are shown on the SDP.

3.5.8. Construction of internal roads

- The proposal is that the main access to the site will be directly from the local District Road, which runs adjacent to the site.
- In order to minimise the effects of dust, the possible upgrading and surfacing of the District Roads as well as the surfacing of the access and internal roads will be evaluated in the development planning process.
- The Roads Authority will be approached for approval of the accesses and possible upgrading of the District Roads.
- Sufficient space will be allowed at the access point to ensure that the vehicles do not stack up on the road while being processed through security. Also the road alignment and layout will take into account the safety precautions necessary for road crossings between PV power plant and the Eskom sub-station.

- The access and internal roads shall be constructed as all-weather type, 3m wide with wide, open side drains forming part of the drainage system.
- The roads will be built with a minimum of 400mm depth of sub-grade preparation and an aggregate base layer of up to 150mm thick compacted to the 95% Proctor (AASHTO). The base layer will either be of material obtained from the excavations on site or aggregate from a commercial source.
- The road layout will be designed in order to ensure ease of access to every rack or tracker structure and the horizontal geometry will be designed to enable the turning of trucks.
- During the operational phase access around the site is generally only required for security and routine inspection. Access for cleaning operations or maintenance is very infrequent, thus generally the internal service roads need only be gravel tracks.
- The topsoil removed would be stored in accordance with best practice methods, and later used for site restoration. Soils needed for backfill would be stored temporarily in bunds adjacent to the excavations until needed. Any remaining excavated material would be recycled to a local site needing clean fill material, or stockpiled for future use.

3.5.9. Construction of Hard Stands

- A registered Civil Engineer would design foundations for concrete foundations.
- A detailed geotechnical investigation would be undertaken to establish the nature of the soils at each identified foundation stands.
- Suitable excavated material would be compacted in layers on top of the concrete foundation to terminate flush with the existing ground level, leaving room to allow sufficient topsoil reinstatement for farming.
- Any wash water from the cleaning of the cement truck drums will be disposed of appropriately and
- There will be no concrete batching plant on the site.
- The soils removed would be stockpiled to the specifications set out in the construction environmental management plan prepared in accordance with best practice guidance. The stockpiled soil will then be used for fill elsewhere and during the restoration phase.
- Soil material needed for backfill would be stored temporarily in bunds adjacent to the excavations until needed.

3.5.10. Balanced Cut and Fill

- To the extent that it is possible a balanced cut, borrow, fill and spoil approach will be followed. Thus any material needed in the construction process, be it for the earthworks, road-works, building foundations or trench backfilling etc. will be sourced from within the development footprint of the site.

- Suitable material will thus be sourced from the cuts and trenches or any part of the development footprint and the un-suitable material will be spoiled into non-engineered, landscaped areas.
- Given the relatively small amount of earthworks in the construction process the only spoil envisaged would be material unsuitable to be used in the road-works or as backfilling that comes from the roadbed, trenches or pile holes. This should be relatively insignificant volumes and can be spread on site. Should the volume be larger; then landscape features such as screening berms around the sub-station and PV plant can be created from the spoil. These would be covered with topsoil and planted.

3.5.11. Construction of a meteorological mast

- A permanent 80meter meteorological mast would be erected. The instrumentation would provide necessary information for the control and monitoring of the site and would be retained throughout the operating life of the wind farm. The permanent anemometry mast selected for the site would be a lattice- work tower.

3.5.12. Trenching of Electrical Works

- All the electrical design and work will be prepared and signed off by a registered electrical engineer.
- The electricity produced from the Photovoltaic modules would be transformed up to 22 kV by a pad- mounted transformer located adjacent to each turbine base, conducted to the switchgear enclosure via underground collection cables, and then routed to the connection the point with the existing ESKOM Substation.
- The electrical collection cable would consist of an armored polyethylene- insulated jacket with copper or aluminum conductors. These cables will be positioned in trenches approximately 600mm wide and 1100mm deep. This depth is considered sufficient to provide protection from surface activities. The trenches will run adjacent to the internal road where possible and warning signage will be erected over the cables at strategic locations.
- The cable trenches will have a granular backfill with pavement or topsoil materials in order to meet the required thermal resistivity requirements.The cable or cables are laid in a suitable bedding material, usually sand.
- If the in-situ material is not suitable for bedding, then bedding material will be sourced from local commercial sources. The trenches are then backfilled using suitable material that came from the trench excavations.
- Trenches are usually excavated by a TLB, but given the quantity of trenching within the PV plant specialist trenching machines might be used.
- A separate may fiber optic cable for communications will be laid in the same trench separate from the electrical connection cable in order to minimize signal interference.

- Buried electrical cable will be marked with permanent safety signs to warn of potential hazards from excavation.

3.5.13. Labour and Workforce

- The project is anticipating employing approximately 30 – 50 various people from within the local community during the various stages of the construction phase. This is aimed at temporary job creation in a manner similar to the goals of the extended public works projects that use labour intensive methods where applicable and practical.

3.5.14. Traffic on and off site

- Access to the site shall be off the existing gravel trunk road turning off into the site. This will be the entry point for all workers, construction equipment and turbine components for the duration of the construction phase.
- During the construction phase the traffic will peak at about 10 large delivery vehicles and 40 to 50 concrete trucks per day while the footings are being cast and then drop to about 20 to 30 large delivery vehicles per day while the electrical reticulation is being installed and the trackers are being erected. Should the preferred option of vibratory driven piles be adopted then the construction traffic would be greatly reduced as there is little concrete required.
- During construction of the internal site roads and turbine foundations, there would be an increase in truck traffic the trunk road leading to and from the Project Site. Increased dust is possible, although water trucks will continually dampen the roads and excavation areas in order to control dust.
- During delivery of the components, delivery of oversized loads may slow traffic flow. Every effort would be made to ensure that oversize loads are delivered during times of lowest area traffic. Road safety measures e.g. flaggers would be provided to coordinate traffic flow and ensure public safety.
- Delivery of materials and equipment would be phased throughout the construction period depending upon the specific construction activity.
- The vehicles likely to be involved include:
    - Large trucks with trailers for delivery of materials,
    - Earth- moving equipment and cargo containers for storage of tools and parts.
    - Tipper trucks to deliver and move stone for building internal site roads.
    - Concrete trucks for constructing foundations.
    - lift cranes
    - Miscellaneous light vehicles including cars and pickup trucks

3.5.15. Construction completion

Once all the construction, erection, and commissioning are completed and the Project is in the start- up phase, all temporary works will be removed and any disturbed areas shall be rehabilitated and restored to the original state.

3.6. Operational Phase

- Once the solar energy facility is operational, there shall very minimal human and vehicle activity will be required.
- The internal site roads will be used for periodic maintenance and safety checks.
- A comprehensive Supervisory Control and Data Acquisition (SCADA) system will be installed for remote monitoring and control, which will minimize the need for on- site personnel. The SCADA system ensures safe efficient operation of each turbine and of the overall Project Site.
- A Large notice board or signage board will be located at the entrance to the site. This sign will provide essential safety information such as emergency contacts and telephone numbers. As well, the sign will provide information about the wind farm and the companies involved in the Project. Safety signs, such as speed limit and safety information, would also be installed throughout the Project Site. These signs will be maintained throughout the operational life of the wind farm.
- Scheduled maintenance work will be carried out several times each year throughout the operational phase. This will involve site light maintenance truck for approximately 6 weeks per year. Unscheduled maintenance is minimal, as the SCADA system provides 24- hour monitoring of the turbines and site.
- As an example, but not limited to, the following activities occur in operation phase:
  - Checking and verifying of the electricity production
  - Maintaining and monitoring a weather station
  - Routine inspection of all equipment and systems
  - Periodic maintenance
  - Cleaning of PV modules
  - Security operations
- The traffic generated by the PV plant during operation phase once the plant is generating electricity is negligible and will be of the order of four or five vehicles per day.

3.7. Decommissioning Phase or Upgrade

After the 20 years of operation, the PV plant will either be upgraded if a new license is granted or the plant will be decommissioned.

Upgrading the PV power plant will consist of replacing old PV modules for new ones, increasing the total peak power of the plant (a process called “Repowering”) or increasing the power of the plant by adding new elements such as trackers, PV modules or transformers.

If the plant is to be decommissioned then the site should be returned to close to its original state. Other than the concrete all of the components of a PV plant have an intrinsic value either for re-use or recycling. This value will cover the cost of decommissioning the plant and rehabilitating the site.

- The PV panels will be removed from the trackers and sent to special recycling facilities without further disassembly at the site.
- The transformers and electrical control devices would either be removed for reuse, with or without re-conditioning, or sold as scrap after removal of the fluids.
- The electrical power management and conditioning equipment would be recycled or disposed of as scrap.
- The underground cable runs could be abandoned in place, or they could be pulled out. The cable has a very high scrap value so the latter is more likely.
- The steel in the fixed rack or tracker structures has high scrap value so these structures will be dismantled and removed for scrap.
- The steel tracker piles can be removed and sold as scrap. Alternatively the steel or the concrete piles can be cut off just below ground level and abandoned.
- The gravel or aggregate in the access road, on-site service roads, in the electrical substations, transformer pads, and building foundations could be removed and recycled for use in other fill operations if not abandoned.
- The buildings can be taken over by the farmer for his operations or all the re-usable material can be removed and the shell demolished and the rubble taken away to a commercial dump site. Temporary buildings can be removed or relocated.

Disturbed land areas can be rehabilitated, the rubble removed, the soil scarified and reseeded or replanted with indigenous vegetation.

Part of the decommissioning and rehabilitation process would be the inspection for and documentation of the presence of industrial wastes in the soil from minor spills or leaks, and decontamination as necessary. If deemed necessary soil testing would be conducted after decommissioning.

Transportation activities during site decommissioning would be similar to but less than those during site development and construction.

4. CONSIDERATION OF ALTERNATIVES

4.1. Background

This section seeks to address the consideration and assessment of alternatives. The EIA Regulations published in Government Notice R543 of 02 August 2010, call for feasible and reasonable alternatives to be considered during environmental impact assessment process. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors.

In terms of the EIA Regulations, the definition of "alternatives" in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity which may include: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; and (e) the operational aspects of the activity. The other critical aspects in the definition of project alternatives are terms such as 'reasonable', 'practicable', 'feasible' or 'viable'. Given the understanding, there are essentially two types of alternatives, the Incrementally different (modifications) alternatives to the Project; and the fundamentally (totally) different alternatives to the Project.

- Fundamentally different alternatives are usually assessed at a strategic level and EIA practitioners recognise the limitations of project-specific EIAs to address fundamentally different alternatives. Electricity generating alternatives have been addressed as part of the National Integrated Resource Plan (NIRP) published by the National Energy Regulator of South Africa (NERSA) and the Integrated Strategic Electricity Plan (ISEP) undertaken by Eskom. Environmental aspects are considered and integrated into the NIRP and ISEP using the strategic environmental assessment approach, focusing on environmental life-cycle assessments, water-related issues and climate change considerations.
- The environmental scoping phase, thus, can only meaningfully consider site-specific alternatives of the proposed Canyon Spring Wind & Solar Energy Facility will be developed, and does not evaluate any other power generation options.

4.2. Project Planning

A great deal of project planning and preliminary design work has gone into the evolution process of the proposed Swartwater Solar Facility. The development of the site development plan and project plan has involved assessment various alternatives based on site findings, desktop analysis, pre- planning, site design, and stakeholder consultation. Alternatives have been considered at various levels:

- **Strategic site selection**: On a broad scale, this was performed to identify an appropriate study area where land could be leased and a proposal for a site could be developed by considering a wide range of technical and environmental criteria.
- The area required for the development of the PV plant is determined by a number of factors. Given that these sites are mostly flat, with a northern orientation, the key factors determining the size of the site needed are the production capacity of the plant and the technology used.

- The density of development is highest for fixed rack systems and lowest if two axis trackers are used. Typically fixed rack systems would take up about 2 to 3 Ha/MW of plant capacity and a PV plant using vertical axis trackers would need about 4.5 to 6 Ha/MW of plant capacity. The current trend in the highly competitive Independent Power Producer market imply that either fixed structures or horizontal single axis tracking systems will most likely be used. Thus the 75MW plant could use about 225Ha.
- For purposes of the EIA it was decided to investigate a larger area than required for the PV plant envisaged for the application. This is in order to provide for sufficient space for the preferred technology and flexibility in the positioning and detail layout of the plant in response to on site or environmental conditions or for design optimisation.
- **Specific site design**: The overall objective of the planning process was to develop a project in a manner that will enhance the positive environmental, social and economic benefits, while reducing or minimizing the negative impact on the receiving environment.
- The site selection process was based on locating sites that matched as many as possible of the ideal criteria for the development of a PV electricity generation plant.
- These selection criteria will filter out alternative sites which are in some way or other not suitable for the development of a PV electricity generation plant that is environmentally and economically sustainable.
- The ideal PV plant site would have the following criteria;
  - High solar irradiation area. This allows for the maximisation of the solar energy received.
  - Flat to gently sloped terrain. This allows for the optimisation of the layouts and minimum interference with respect to shadows etc, between the individual trackers.
  - Northern orientation or no high obstructions to the north, east or west. This allows for efficiency.
  - Not in high potential agricultural land. This avoids conflict with competing activities and the national priority of food security.
  - Not in an environmentally sensitive area.
  - Suitable ground conditions. This is for the stability of the structures and reduction of construction costs.
  - Adjacent to an existing Eskom sub-station or power-lines on the Eskom grid. This avoids the necessity of transmission infrastructure and associated transmission losses.
  - Existing capacity at the sub-station and local grid to receive the generated electricity.
  - Potential to expand. This is about the sub-station having a reasonable demand growth and there being space for the expansion of the PV plant.

4.3. Strategic Site Selection Criteria

A range of criteria has been considered which affect the suitability of an area for a wind & solar Energy Facility and which could potentially constrain development. The criteria include technical, environmental, and land use considerations. The following is a comprehensive list of the criteria considered:

- Technical Considerations
    - Sufficient wind resource
    - Capacity of the local electrical distribution network
    - Proximity to ESKOM substation
- Environmental Considerations
    - Proximity to provincial or nationally significant parks or wetlands
    - Proximity to natural areas and sensitive environments
    - Any other sensitive provincial or municipal designations
- Land Use Considerations
    - Available access to the land and suitable ground conditions
    - Other nearby land uses in the area
    - Proximity to residential properties, communities, and towns
- Planning Considerations
    - Municipality official plans and zoning by-law regulations
    - Provincial Policy Statement and regional planning ordinances

4.4. Site Alternatives

The portions of land making up the proposed Swartwater Solar Energy Facility were chosen based on site selection and iterative design process based on all considerations outlined in the planning phase but also on the basis of ownership and willingness of the land owner to develop such a facility. Before zeroing in on this specific site, a number of other sites throughout the region province were looked, however few met the screening criteria. The proposed development site was therefore chosen because it met all the screening criteria.

4.5. The ‘Do Nothing’ Alternative

The electricity demand in South Africa surpassed existing power generation capacity in 2008, causing nation-wide black-outs and load shedding. The crisis has temporally been averted through the forced reduction of use to the mining industry by 10%, causing vast job-losses in its wake. South Africa requires additional capacity if it is to meet the growing demand for electricity. The 'do nothing' option will, therefore, contribute to these electricity demands not being met. Not meeting the growing electricity demand will have major adverse impacts on economic activity and economic growth in South Africa, which in turn will have an adverse impact on socio- economic development in South Africa. Additional electricity generation options will contribute to meeting this energy demand. The recent increase in oil prices, the exhaustibility of fossil fuels and the urgent need for stable, reliable, non-polluting sources of electrical energy that are indispensable to a modern industrial economy focuses attention on alternative energy, such as renewable energy sources.

5. LEGISLATIVE REQUIREMENTS

5.1. Introduction

This section provides a brief overview of the environmental legal requirements that are likely to have direct or indirect bearing or influence on the proposed project, and which need to be taken into consideration during the Scoping/EIA process and the design, construction and operation of the project.

The following outlines the various key pieces of legislation and policies from National, Provincial, and Local Government that have been considered in this scoping report.

5.2. National Constitution of the Republic of South Africa

The Constitution of the Republic of South Africa, 1996 has major implications for environmental management. The main effects are the protection of environmental and property rights, the drastic change brought about by the sections dealing with administrative law such as access to information, just administrative action and broadening of the locus stand of litigants. These aspects provide general and overarching support and are of major assistance in the effective implementation of the environmental management principles and structures of the Environment Conservation Act and NEMA. Section 24 in the Bill of Rights of the Constitution specifically states:

"Everyone has the right –

- To an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
  - Prevent pollution and ecological degradation;
  - Promote conservation; and
  - Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

This section of the Constitution obliges industries and organisations that are responsible for generating waste, to manage the waste in a way that will not cause pollution and thus negatively affect the health and well being of humans.

5.3. National Environmental Management Act, 1998 (Act 107 of 1998)

The overarching environmental legislation for the management of the environment in South Africa is the National Environmental Management Act, 1998 (Act 107 of 1998 “NEMA”) and its amendments. The of this legislation states that sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that development serves present and future generations. Chapter 5 of NEMA makes provisions for regulations to be formulated and published. The current EIA regulations were published in Government Notice No. R543, and supplemented by Notices 544, 545 and 546of 2010. Section 28 of the Act places a duty of care on all persons not to degrade and pollute the environment, and should any such pollution or

degradation occur, remedial steps must be taken. The liability regime is such that employees, companies and directors may accrue personal liability for cleanup and in some instances criminal prosecution should an environmental crime be committed. Section 30 of NEMA prescribes the steps to be taken should an environmental emergency incident occur.

5.4. National Water Act, 1998 (Act 36 of 1998)

The National Water Act (NWA) administered by DWAF aims to manage and protect the national water resources to achieve sustainable use of water for the benefit of all water users. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, and managed in ways that take into account:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for the growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

5.5. National Environmental Biodiversity Act, 2004 (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA. This Act allows for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources and the establishment and functions of the South African National Biodiversity Institute.

Key elements of the Act are:

- The identification, protection and management of species of high conservation value;
- The identification, protection and management of ecosystems and areas of high biodiversity value;
- Biodiversity Initiatives such as the STEP (Subtropical Thicket Ecosystem Plan) and Biodiversity Conservation plans e.g. the Eastern Cape Biodiversity Conservation Plan.
- Alien invasive species control of which the management responsibility is directed to the landowner; and

- Section 53 of the Act identifies that any process or activity that is regarded as a threatening process in terms of a threatened ecosystem, requires environmental authorization via a full Environmental Impact Assessment.

5.6. National Heritage Resources Act, 1999 (Act 25 of 1999)

The National Heritage Resources Act 25 of 1999 was introduced to ensure protection of South Africa's important heritage features. The act covers the following areas of heritage value:

- Archaeology
- Palaeontology
- Meteorites.
- Old structures
- Graves, both old and new
- As well as areas of historic cultural significance.

Tools used to conserve and manage these resources are the formal regulated EIA processes as well as permits issued by the South African Heritage and Resources Agency (SAHRA) to restrict and/or regulate development within a heritage environment. No heritage item may be removed, damaged or destroyed without authorisation. If the heritage assessment is performed as part of the EIA process, the comment of the responsible heritage agency must be obtained prior to a decision being made by the environmental authority.

5.7. Aviation Act, 1962 (Act 74 of 1962)

The Minister of Transport has under section 22(1) of the Aviation Act, 1962 (Act No 74 of 1962) promulgated the Civil Aviation Regulations (CAR's) of 1997. This legislation and regulations are primarily intended for ensuring safety of civil aviation. The key parts of these regulations, which are likely to have a direct bearing on the proposed wind farm, include the following:

CAR Part 139.01.33 - Obstacle limitations and marking outside aerodrome or heliport:

- Any structure exceeding 45m above ground level, or structures where the top of the structure exceeds 150m above the MEAN ground level, like on top of a hill, the mean ground level considered to be the lowest point in a 3 Kilometer radius around such structure. Structures lower than 45m, which are considered as a danger or a potential danger to aviation, shall be marked as such when specified.
- Specified markers are to be used to highlight structures when it is impractical to make them conspicuous by painting.
- Specifications on the placement and Location of wind farms
- Specifications on the spacing of Wind Turbines
- Specifications on the Lighting of wind turbines

Part 91.01.10 of the CAR of 1997 - endangering safety, which states "No person shall, through any act or omission endanger the safety of an aircraft or person therein, or cause or permit an aircraft to endanger the safety of any person or property".

Part 185.00.1(1) (f) makes non-compliance with the above-mentioned Regulation an offence.
An application to the Civil Aviation Authority shall be submitted for the authorization of the proposed wind farm component of the project, including the Meteorological mast.

5.8. Occupational Health and Safety Act, 1993 (Act 85 of 1993)

The Occupational Health and Safety Act 85 of 1993 is South Africa's principle legislation concerning health and safety of employees. It also aims to protect persons who are not at work against hazard to health and safety arising out of or in connection with the activities of persons at work.
The Act places the responsibility on the employer to ensure a safe and healthy working environment and to cause every employee to be made conversant with health and safety requirements relevant to their work. At the same time the Act places the responsibility on the employee to follow its employer's health and safety procedures and instructions. A number of Regulations have been promulgated under the Act that are relevant to development including the following:

- General Administrative Regulations, 1994
- Asbestos Regulations, 2001
- Lead Regulations, 2003
- Regulations for Hazardous Chemical Substances, 1995
- Hazardous Biological Agents of 2001;
- General Safety Regulations, 1986
- Environmental regulations for workplaces (Department of Labour, 1994); and
- Construction Regulations, 2003.

5.9. National Forestry Act 84 of 1998

This Act is relevant for managing protected trees. A list of protected trees has been identified and no tree on the list may be removed, destroyed or damaged prior to authorisation being obtained from DWAF.

5.10. Fencing Act 31 of 1963

Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.

5.11. National Veld and Forest Fire Act 101 of 1998

The purpose of the Act is to prevent and combat wildfires, veld, and forest and mountain fires throughout the Republic. A duty is placed on landowners to maintain firebreaks.

5.12. National Energy Act (Act No 34 of 2008)

The Act is aimed to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors. The Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The act also establishes an institution to be responsible for promotion of efficient generation and consumption of energy and energy research; and to provide for all matters connected therewith.

5.13. Guideline Documents

The following guideline documents were considered amongst others:

- DEAT (2005) Guideline 3: General Guide to Environmental Impact assessment Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2005) Guideline 4: Public Participation, in support of the EIA Regulations 2005,
- Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria; and
- DEAT (2006) Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Integrated Environmental Management (IEM)

Changes to these guidelines following the amendments to NEMA and the EIA Regulations, and have been considered

The general approach to this study has been guided by the principles of Integrated Environmental Management (IEM). In accordance with the IEM Guidelines (Department of Environmental Affairs and Tourism (DEAT), 1992), an open, transparent approach, which encourages decision-making, that has been accountable, has been adopted. IEM is a procedure for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (DEAT, 1992). The IEM guidelines intend encouraging a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

Further to the above guidelines, other best practice guideline documents from other provinces and also international source have been used in the scoping report and also in the environmental impact assessment phase to be done. Among these guidelines are those developed by the Western Cape Provincial Environmental Department, which include:

- Guideline for Determining the Scope of Specialist Involvement in EIA Processes;
- Guideline for the Review of Specialist Input into the EIA Process;

- Guideline for Involving Biodiversity Specialists in EIA Processes;
- Guideline for Involving Heritage Specialists in EIA Processes;
- Guideline for Involving Visual and Aesthetic Specialists in EIA Processes;
- Guideline for Involving Economists in EIA Processes;
- Guideline for Involving Hydro geologists in EIA Processes;
- Guideline for Environmental Management Plans; and
- Guideline for Involving Social Assessment Specialists in EIA Processes.

International Guidelines used include:

- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002);
- Visual Assessment of Wind Farms – Best Practice" (Scottish Natural Heritage, 2002).

Those EAP and the specialists involved with the proposed Solar Energy Facility have and shall ensure these guidelines are used and implemented where applicable and appropriate.

5.14. Policy on Renewable Energy

The White Paper on Renewable Energy supplements the government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998), which pledges 'Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications'.

Government's overall vision for the role of renewable energy in its energy economy is:

An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation.

The purpose of this White Paper is to set out government's principles, goals and objectives for renewable energy. It furthermore commits government to a number of enabling actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing the environmental impacts.

5.15. Land Use Planning Legal Requirements

A registered town and regional planner has submitted an application for the rezoning of the site to special zone use with due consideration of the Land Use Planning Ordinance 15 of 1985 (LUPO) and the Development Facilitation Act no. 67 of 1995.

6. METHODOLOGY FOR IMPACT ASSESSMENT

This section provides a detailed description of the environmental impact assessment process and the methodology used to complete the environmental impact assessment study for the Swartwater Photovoltaic Solar Energy Facility.

6.1. The Environmental Impact Assessment Regulations

The overarching environmental legislation for the management of the environment in South Africa is the National Environmental Management Act, 1998 (Act 107 of 1998 "NEMA") and its amendments. The of this legislation states that sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that development serves present and future generations. Chapter 5 of NEMA makes provisions for regulations to be formulated and published and these became effective from August 2010.

These EIA regulations replaced the Environmental Impact Assessment Regulations promulgated in 2006. Section 24 (F) of the NEMA prohibits a listed activity from commencing prior to the authorisation thereof by the competent authority.

The purpose of these Regulations is "to regulate procedures and criteria as contemplated in Chapter 5 of the National Environmental Management Act for the submission, processing, consideration and decision of applications for environmental authorisation of activities and for matters pertaining thereto."

In terms of these EIA Regulations, there are two major categories of Environmental Impact Assessment Processes namely:

- Basic Assessments:
- Scoping and Environmental Impact Assessment (commonly referred to as Full EIAs).

6.2. Listed Activities

Further to the above, the in EIA Regulations in Government Notice No. R. 543 make reference to a schedule of listed activities which may not commence prior to authorization. These contemplated listed activities are identified in Government Notices No. R. 544, No. R. 545 and No. R. 546 of 2010.

The relationship of the listed activities and the EIA process is as follows:

- In terms of Environmental impact assessment process, all listed activities identified under Government Notices No. R. 544, and No. R. 546 of 2010, require a Basic Asssessment to be undertake as part of the application for authorization; and
- All listed activities identified under Government Notices No. R. 545 require a scoping and environmental impact assessment to be undertaken as part of the application for authorization.

With respect to the proposed Swartwater Photovoltaic Solar Energy Facility the following table summarises the listed activities, which the proposed development is likely to trigger, for which this Scoping Report and Application for Environmental Authorization has been prepared.

Table 1: Listed Activities likely to be triggered by the Sawartwater Photovoltaic Solar Facility

Notice number	Activity Number:	Description of Listed Activity
544, 18 June 2010, Listing Notice 1	10	The proposed Swartwater Solar PV shall involve the Construction of a 132kV Powerline from the proposed Solar PV Power Plant to loop into the existing 132kV ESKOM Powerline near the site. This will trigger listed Activity described as: "*The construction of facilities or infrastructure for the transmission or distribution of electricity (i) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolt."*
544, 18 June 2010, Listing Notice 1	22	The proposed Swartwater Solar PV shall involve the Construction of a main access road off the Existing District Road running adjacent to the site. Further a number of site Internal roads will be constructed to service the various key areas within the Solar PV Power Plant. This will trigger listed Activity described as: "The construction of a road outside urban areas (ii) Where no reserve exists where the road is wider than 8 meters."
545, 18 June 2010, Listing Notice 2	1	The proposed project shall involve the Construction and Development of a 75MW Solar Photovoltaic Power Plant and associated Substation for generation of renewable energy. This will trigger listed Activity described as: "The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 Megawatt or more."
545, 18 June 2010, Listing Notice 2	15	The proposed Swartwater Solar PV shall involve the clearing and construction of infrastructure including concrete foundations, roads, powerline trenches, a substation, control building and other associated infrastructure on a total area of approximately of 225 Hectares. This will trigger listed Activity described as: *"Physical alteration of undeveloped, vacant or derelict land for residential, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 ha 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.

Given the above listed activities likely to be triggered by the proposed development, whereby a number of activities fall within Government Notices No. 545, and some fall within Government Notices No. 544, the proposed development will be subjected to a detailed scoping and environmental impact assessment process. The Scoping and Environmental Impact Assessment Process to be followed is illustrated by Figure below.

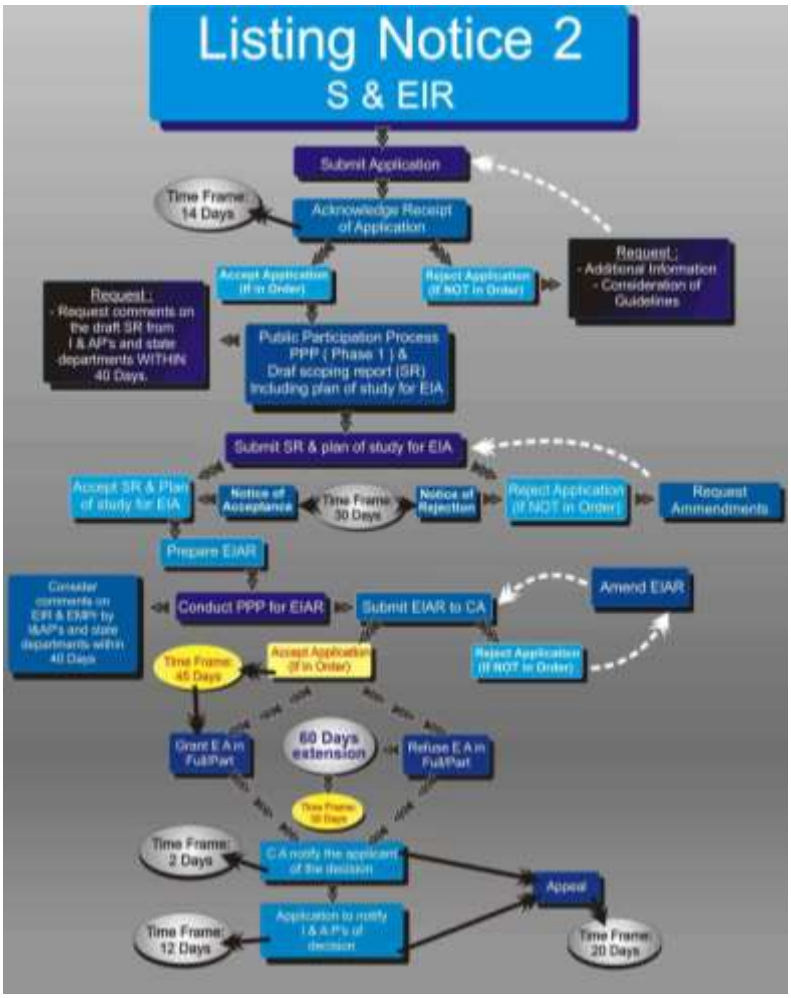


Figure 17 Scoping and EIA Process Flow Chart

6.3. The Scoping Phase

6.3.1. The Competent Authority

The competent authority in respect of this application will be the National environmental authority; the Department of Environment Affairs (DEA) in Pretoria, specifically because of the listed activities above includes an Energy Generation Facility, which is a national competency. The Northern Cape – Department of Environment and Nature Conservation (DNEC) has been notified as a key stakeholder in a commenting capacity on the Scoping and EIA process.

6.3.2. Application Form

An application form was completed by USK Environmental & Waste Engineering (Pty) Ltd and shall be submitted to DEA on the 4th June 2013 along with a Declaration of Interest and other supporting documents. The DEA office acknowledged the receipt application form and issued a reference number for the application – Reference Number **DEA REF No. 14/12/16/3/3/2/564** (see **Annexure A** for copy of the Application form acknowledgement of receipt).

6.3.3. Consultation with Authorities and Key Stakeholders

During the scoping phase a number of stakeholders and other regulating authorities were identified and were furnished with the background information document and requested to comment on the proposed development. These authorities include *inter alia*:

6.3.4. Identification of Potential Environmental Impacts

Potential positive and negative direct and indirect environmental impacts associated with the proposed project were identified within the scoping phase and have been evaluated through desktop studies and site inspection. As early as the scoping phase a number of specialists have undertaken some desktop studies and, or had input into the scoping report.

6.3.5. The Draft Scoping Report

A Draft Scoping report (this report) with the findings of the scoping phase of the proposed project has been prepared. The report documented the issues identified through the site visit, the Public Participation Process (PPP) as well as through the professional input of the relevant specialists and the EAP team. The DSR was prepared for purposes of public review and comment.

6.3.6. The Public Participation Process

In terms of the EIA Regulations a detailed and appropriate Public Participation Process must be undertaken during the scoping phase. The details of the public participation process undertaken are presented in section 9 of this report.

6.3.7. The Plan of Study for EIA

In terms of the EIA Regulations a Plan of Study (PoS) for EIA, must be prepared and submitted as part of the Scoping Report and is presented in Section 10 of this report.

6.3.8. The Final Scoping Report

All public comments on the DSR will be captured into an Issues and Response Report (IRR), and these will be considered and included in the Final Scoping Report and the Environmental Impact Assessment Phase to be submitted to the Department of Environmental Affairs and other authorities. All registered I&APs will be notified of the availability of the thereby the FSR submitted to DEA in order them to note how their comments and issues were addressed.

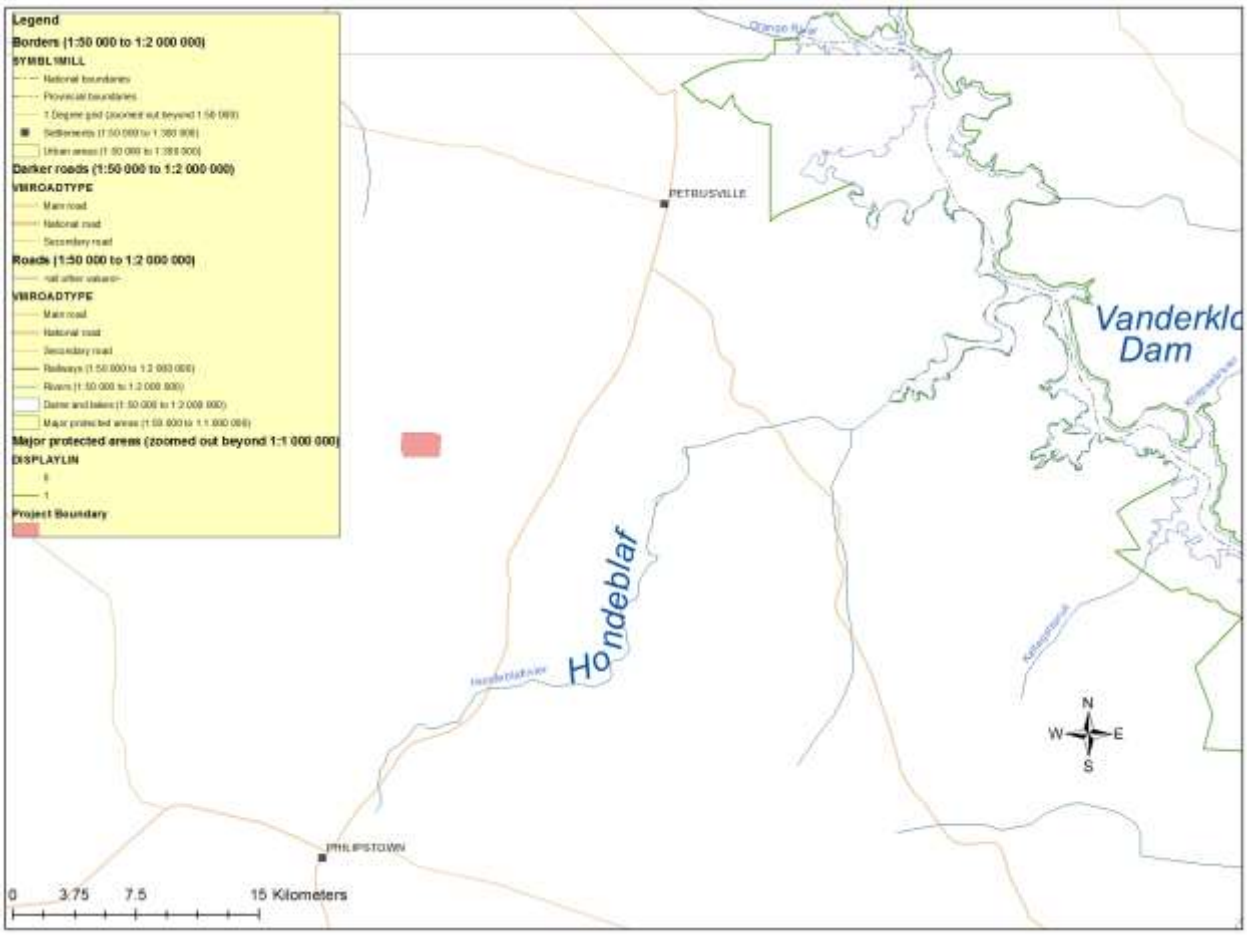
7. DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section provides a description of the receiving environment and local setting within which the Canyon Spring Wind & Solar Energy Facility will be developed.

7.1. The Project Regional Setting

7.1.1. Administrative Region

The proposed Swartwater Solar Energy Facility will be located within Renosterberg Municipality, which is a category B, local municipality in Pixley ka Seme District the Eastern Karoo Region of South Africa. The closest town to the proposed project site is Petrusville located approximately 19 Km North East of the site.



7.1.2. Socio-Economic Context

Renosterberg Municipality has a very sparsely populated area with an estimated total population of 10978 people according to the 2011 census figures (Stats SA, 2011). The population growth rate of the municipality is 1.91% per annum.

The table below provides a summary of the socio-economic demographics of this small municipality.

Demographic	Values
Age Structure	Population Under 15 - 32.80% Population 15 To 64 - 61.00% Population Over 65 - 6.20%
Dependency Ratio	Per 100 (15-64) 64.00
Sex Ratio	Males per 100 females 95.80
Labour market	Unemployment Rate (official) - 26.80% Youth Unemployment Rate (official) 15-34 - 29.80%
Education (aged 20 +)	No Schooling -16.00% Higher Education - 6.60% Matric - 21.80%
Household dynamics	Households - 2 995 Average Household Size - 3.40 Female Headed Households - 34.80% Formal Dwellings - 94.70% Housing Owned - 52.30%
Household services	Flush Toilet Connected To Sewerage -71.70% Weekly Refuse Removal - 74.40% Piped Water Inside Dwelling - 53.40% Electricity For Lighting - 88.10%

7.2. The Biophysical Environment

7.2.1. Climate

The study area in the Eastern Upper Karoo receives most of its rain in summer with a peak in late summer to autumn (March). Mean annual precipitation (MAP) ranges from 254—295 mm. Frost can occur soon after the autumn rains in late April and early May when temperatures drop significantly. This results in a relatively short growing season. In summer daytime maximum temperatures can reach as high as 43°C with mean maximum around 28°C whereas winter minimum temperatures can reach as low as -5°C with mean temperatures of around 8°C. (Palmer & Hoffman, 1997; Watkeys, 1999; Mucina *et al.* 2006; Esler, Milton & Dean, 2006).

7.2.2. Geology and Soils

Geological and soils assessment was based on the 1:250 000 geological mapping and preliminary site inspection by a specialist. According to the geological map the study area falls within the Karoo sequence and belong to the Beaufort Group, These are sediments of mudrock and subordinate sandstone that were laid down in the Karoo Basin during the Middle Permian to the early part of the Middle Triassic Periods. These sediments are well known for their fossil assemblages of proto-mammalian, insect and plant fossils. During the Late Triassic into the Jurassic Periods igneous lava penetrated though the Karoo sediments and formed dykes and sills of dolerite which spread over the Karoo sediments. Subsequent erosion has left exposed mesas, buttes and ridges with tops of hard, resistant igneous rock and slopes of softer more

easily eroded sedimentary rock. This has given rise to the well-known 'Karoo landscapes' and the landscapes found on Bultfontein and Bulthoudersfontein are of this type. However, in the north-east corner of Bultfontein the small, low hills areinsignificant at a large scale and are mostly overlooked.

The soils on the proposed site footprint have been identified as follows:

- Glenrosa & Mispah
- Glenrosa & Mispah 2
- Swartland and Shortlands
- Oakleaf

A specialist shall be appointed to provide a detailed description of these soils and the potential impact of the project on these soils during the EIA Phase.

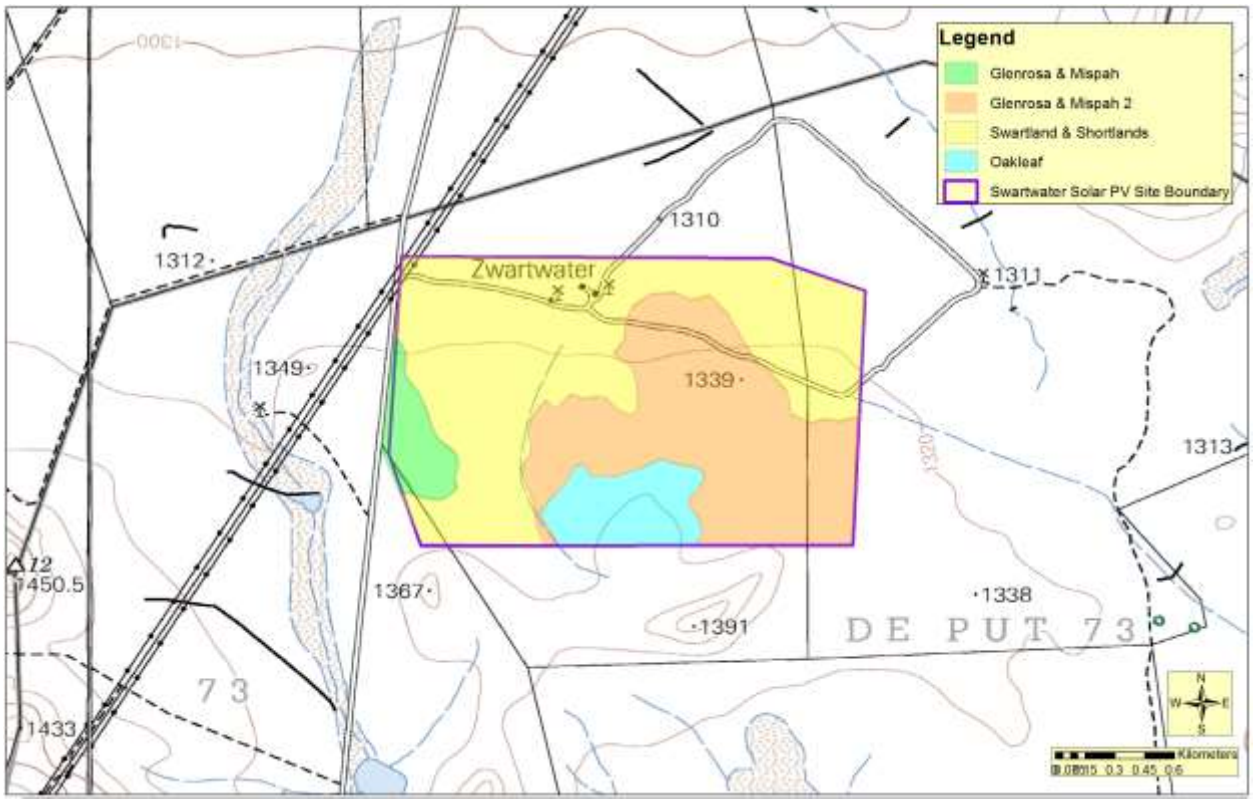


Figure 18 Soil types on the proposed Development Site

7.2.3. Topography and Landform

The topography of the site can be described as flat plains to steep and gentle slopes in various areas of the site ranging between at 1320-1380 masl. The topography of the background and surrounding areas also generally slopes, koppies and rolling hills. The site cross sections and digital terrain model below illustrate the topography and slope of the site.

Figure 19 North - South Topography

Figure 20 West - East Topography

Figure 21 North West to South East Topography

Figure 22 South West to North East Topography

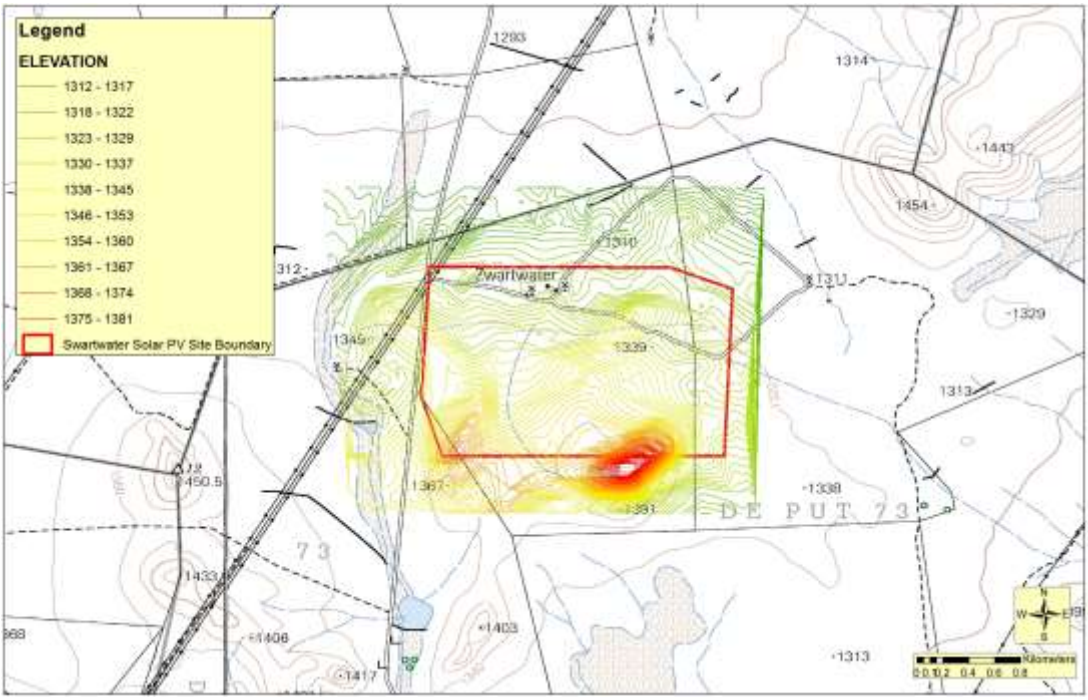


Figure 23 Site Contour Map

7.2.4. Hydrology

The area is drained by a number of small watercourses, streams and surface drainage systems, one which flows from the centre of the proposed site to the eastern side of the project boundary and another from a Koppie on the south east boundary towards the centre of the proposed site. A more elaborate watercourse flows parallel to the western boundary of the site. All the watercourses, streams and natural drainage on the site have been identified and buffered with a 30 meter, and shall be considered as a No-Go area for the project.

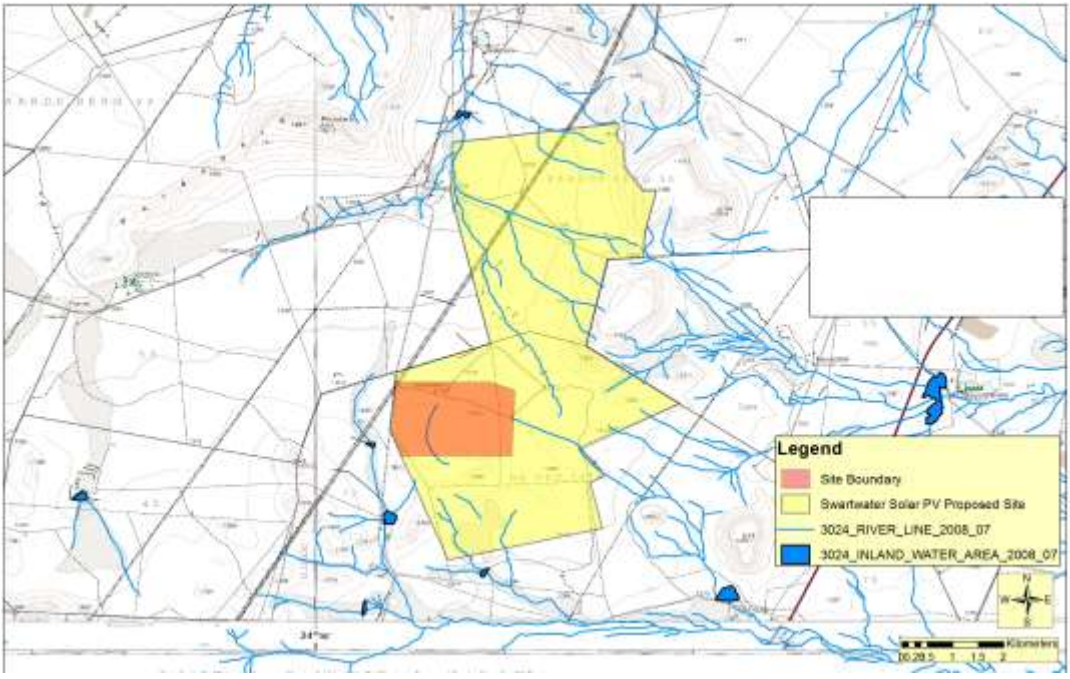


Figure 24 Watercourses and Drainage on and Around the Proposed Site

7.2.5. Agricultural Potential

There is currently limited agrarian activity on the development site itself and also the immediate surrounding farms evidence the low agricultural potential of the site. This is due to fact that the site is located in an area, which generally has shallow, leached soils, which accounts for the low agricultural potential of the land. The other reason is the low rainfall pattern of the area. However the Land cover, which is predominantly Karoo grasses and shrubland are suitable for animal grazing especially sheep. A detailed agricultural potential and soil impact assessment shall be conducted during the EIA phase.

7.2.6. Vegetation and Land cover

7.2.7. Eastern Upper Karoo

The Predominant Vegetation type on the proposed development site is the Eastern Upper Karoo of the upper Karoo Bioregion of the Nama-Karoo Biome. This vegetation type occurs in parts of the Northern Cape, Eastern Cape and Western Cape Provinces: Between Carnarvon and Loxton in the west, DeAar, Petrusville and Venterstad in the north, Burgersdorp, Hofmeyr and Cradock in the east and the Great Escarpment and the Sneeuberge-Coetzeesberge mountain chain in the south.

This vegetation type mainly occurs at Altitudes between mostly 1 000–1 700 m above mean sea level.

The Eastern Upper Karoo vegetation is complex mix of grass and shrub dominated vegetation types, which are subject to dynamic changes in species composition dependent on seasonal rainfall events, occurs within this vegetation type. Common shrubs include Bitterkaroo *Pentzia incana, Kapokbush Eriocephalus ericoides,* Thornkapok *E. spinescens and Hermannia spp.,* while grasses, such as *Aristida spp., Eragrostis* spp. and Redgrass *Themeda triandra,* may dominate the landscape after good summer rains, especially in the north-east. Trees are not abundant, except along the dry river beds where Sweet Thorn *Acacia karroo* is a common element. This type has the highest cover of herbs of all the Nama Karoo types, as well as numerous geophytes (Hoffman et al. 1999).

In terms of National Biodiversity Assessment (2006), the conservation status of this vegetation type is considered as Least threatened, with a Target of 21% and is Statutorily conserved in Mountain Zebra and Karoo National Parks as well as in Oviston, Commando Drift, Rolfontein and Gariep Dam Nature Reserves. About 2% of the unit has been transformed, largely due to building of dams (Gariep, Grassridge, Killowen, Kommandodrift, Kriegerspoort, Lake Arthur, Modderpoort, Schuil Hoek, Vanderkloof, Victoria West, Wonderboom and Zoetvlei) (Rutherford & Mucina, 2006).

This vegetation type is widely infested with alien vegetation such as *Medicago laciniata* is a common and other alien plants.

Other key issues affecting this vegetation type include:

- Soil Erosion which ranges from moderate (60%) and high (38%).
- Over grazing
- Other agricultural practices.

7.2.8. Besemkaree Koppies Shrubland

The second Vegetation type found on the southern side of the proposed development site is the Besemkaree Koppies Shrubland of the upper Karoo Bioregion of the Nama-Karoo Biome. This vegetation type is widely spread from the Northern Cape, Free State and Eastern Cape Provinces: On plains of Eastern Upper Karoo (between Richmond and Middelburg in the south and the Orange River) and within dry grasslands of the southern and central Free State.

It occurs on Extensive dolerite-dominated landscapes along the upper Orange River belong to this unit as well and extends northwards to around Fauresmith in the northwest and to the Wepener District in the northeast. This vegetation type mainly occurs at Altitudes between mostly Altitude 1 120–1 680 m above mean sea level.

This vegetation type is mainly found on slopes of koppies, butts, and tafelbergs with the plains of the Eastern Upper Karoo (Mucina et al. 2006). It is described as a two-layered karroid shrubland. The Lower closed canopy being dominated by dwarf small leaved shrubs and the specially in the precipitation rich years, also by abundant grasses. The upper loose canopy layer is dominated by tall shrubs, namely Rhus erosa, Rhus burchellii, Rhus ciliate, Euclea crispa subsp. Ovate, Diospyros austro-africanus and Olea europea subsp. African (Mucina at al, 2006a).

In terms of National Biodiversity Assessment (2006), the conservation status of this vegetation type is considered as Least threatened because largely excluded from intensive agricultural activities. Target for conservation are 28%. About 5% is statutorily conserved in the Rolfontein, Tussen Die Riviere, Oviston, Gariep Dam, Caledon and Kalkfontein Dam Nature Reserves. In addition a small patch is also protected in the private Vulture Conservation Area. About 3% of the area has been lost through building of dams (Bethulie, Egmont, Gariep, Kalkfontein, Vanderkloof and Welbedacht Dams). Erosion moderate (68%), high (20%) and low (10%).

It is notable from the site inspection that large portions of this vegetation type to the south have been transformed due to agriculture mainly grazing, veld burning etc.

7.2.8.1. Protected and Red Data Species on record for the area

A detailed ecological impact assessment study shall be conducted during the Environmental Impact Assessment Phase to determine if there are any floral and faunal species on record for the area of the study site and its immediate surroundings, which are regarded as protected or red data species and shall be classified as follows:.

- VU = Vulnerable;
- NT = Near Threatened;
- EN = Endangered;
- CR = Critically Endangered;
- PR = Protected; or
- NL = Not Listed

The proposed site is located mostly on old grazing lands which has been heavily impacted by grazing and veld management activities.

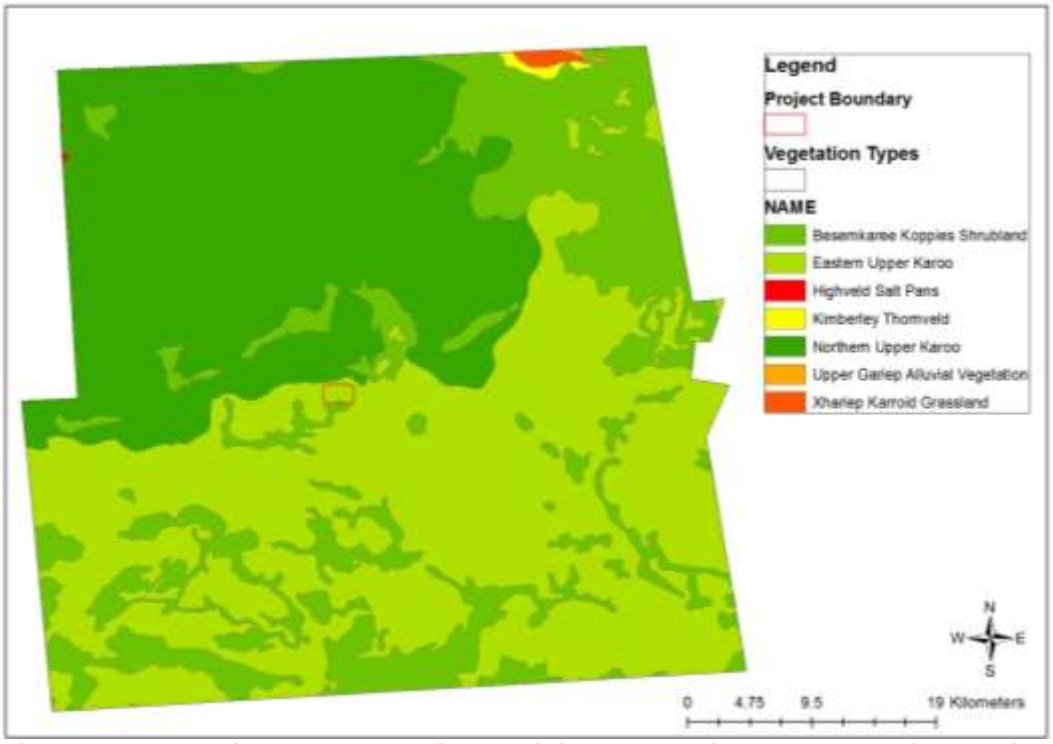


Figure 25: Vegetation types on and around the proposed Swartwater Solar PV Site

7.2.9. Fauna

The site is likely to have a number of faunal species other than the herds of sheep which the farm owner frequently grazes on the site. The ecological impact assessment report to be done during the EIA phase shall describe the details of these faunal species found on the site, including the avian fauna species typically associated with the vegetation types and habitats found on site. These data shall be classified and evaluated according to the following classifications:

VU = Vulnerable; NT = Near Threatened; EN = Endangered; CR = Critically Endangered; PR = Protected; NL = Not Listed

8. POTENTIAL ENVIRONMENTAL IMPACTS

This chapter describes the environmental issues and impacts as identified by the EAP. Because wind energy projects have mostly similar impacts, the issues and impacts identified in this chapter are similar to those identified by the registered I&APs and stakeholders.

The construction and operation of Photovoltaic modules on a large scale can result in negative local environmental impacts e.g. on birds, landscapes, and sustainable land use (including protected areas, etc). The negative environmental impacts from wind energy installations are much lower in intensity than those produced by conventional energies, but they still have to be assessed and mitigated.

On the other hand, wind and solar generated power also has a number of positive impacts when considering the greater scheme of electricity generation. One of these is the fact that wind power is one of the cleanest renewable resources available. So while many of the negative impacts may be on a local scale, the positive impacts may have a global reach. This chapter discusses the impacts (negative and positive) likely to be associated with the project.

8.1. Environmental Screening Criteria Checklist

In order to identify and effectively assess the potential environmental impacts of the proposed development, an environmental screening criteria checklist was used and completed as follows.

Table 2: Environmental Screening Criteria Checklist

Criteria		Yes	No	Description and Comments
1.	Surface water and Groundwater			
1.1	Negative effect on surface water quality and water flow	Yes		• The project will involve construction or decommissioning activities within surface watercourses during construction of drainage crossings. • Mitigation measures will have to be put in place during the construction of the crossings and in areas close to watercourses to ensure that there is limited or no significant impact on the water quality and flow of the streams. • Surface water turbidity, EC, and TDS may be increased by the erosion of construction areas (limited to construction and decommissioning phases only). • The construction and operation of the development will not involve any abstraction of water from a watercourse and will also not involve the usage or storage significant amount of water. • Surface runoff patterns will not be significantly altered by the project.
1.2	Negative effect on groundwater quality and water flow	Yes		• The project will not involve any groundwater abstraction. • There is potential for groundwater contamination due to accidental spills of hazardous substances during the construction, maintenance, and decommissioning phases of the project. • The impact on groundwater quality and flow is therefore likely to be of very low significance.
2.	Soils (geology) and topography			

2.1	Negative impact of soil contamination, and compaction of soils.	Yes		• The project will involve the construction of concrete foundations for the PVs and other site associated infrastructure, which is likely to have impact on topsoil loss, compaction of soils, soil erosion etc. • Although the total area to be disturbed (foundation foot print) is minimal compared to typical construction sites, mitigation measures will have to be put in place to manage these impacts. • The more significant impact on soil, will come from the construction of roads, and trenches for the cabling.
3.	Ecological Impact			
3.1	Negative impact on vegetation and other flora?	Yes		• The project will vegetation clearance and ground cover clearing during the construction phase. This is likely to have some type of impact on vegetation and flora on the sire. • A detailed ecological impact assessment will be undertaken to determine the significance of this impact. • However from the site visits undertaken as part of the scoping report, the site appears to be in an already transformed or impacted state.
3.2	Negative impact on wetlands and riparian vegetation	Yes		• Given that the project site has a number of watercourses and a small marshy area, the ecological impact assessment has to address this impact. • However construction areas will be designated such that they stay away from any sensitive wetland or marshy areas, which shall be deemed as NO-GO Areas.
3.3	Negative impact on Birds and Avian Species		No	• Solar PV projects are not, known to have negative impact on birds.
3.	Heritage, Archaeological and Cultural			
3.1	Negative impact on graveyards, rock art, historical buildings, archaeological site and artifacts etc.		No	• Based on the site walkabout inspections, there was no evidence of any sites or features of heritage, archaeological and cultural importance observed or noted. • A grave site was observed on the site, but not on the proposed footprint of the PV Arrays. • A phase 1 archaeological impact assessment will be conducted during the EIA phase in order to completely ascertain this issue.
4.	Noise Impact			
4.1	Negative impact of noise on surrounding receptors (residential areas, institutions, and business sites).	Yes		• The construction of the PV structures is likely to have some noise impact on the surrounding but there is generally no sensitive receptors near the site. \ • The Operation phase of Solar PVs is not known to have any significant noise impact.
4.	Visual Impact			
4.1	Negative impact on Aesthetically pleasing and scenic landscape	Yes		• The construction of PV structures and meteorological mast is likely to have some impact on the viewscape especially since the site is located in a fairly rural natural landscape. • The PVs are generally located at heights close to the ground level and might not be visible from far distances. • This issue will be addressed by a screening level visual impact assessment study.
				•
5.	Socio-economic Impact			
5.1	Negative impact on	Yes		• There are currently no such facilities in the area so

	neighborhood and community character			adding a project of this nature will change the agricultural and rural character of the community. However it is important to note that neighborhood or community effects are subjective in nature.
5.2	Negative impact on local businesses, institutions or public facilities?		No	• No negative impact anticipated
5.3	Negative impact on local Tourism?		No	• No negative impact anticipated, as there is currently no tourism in the immediate local area or surrounding the site.
5.4	Negative impact on the local economy or the municipal economy?		No	• No negative impact anticipated, but rather a positive economic impact as a result of increased tax base, job creation, increased capacity of electricity in the area, especially green power. • There is also likely to be some jobs created during the construction of the project, up to 30 people especially youth and women are likely to be employed during this phase.
5.	Traffic Impact			
5.1	Negative impact on traffic?	Yes		• During construction and decommissioning, delivery and removal of equipment to the site will result in a temporary increase in local traffic. • The operational phase is not likely to have any significant impact on local traffic.
5.2	Negative impact on public health and safety.	Yes		• Health and Safety risk related to construction work and electrical installation will be possible during the construction and decommissioning phase. • Mitigation measures based on Occupational health and safety Act, will be put in place to manage these risks. • All power generation and electrical installations have got significant health and safety risks. However this facility will be a high security and controlled access facility to ensure that any unauthorized person does not access it.

Yes = Means the impact is identified as a potential impact and shall be assessed in detail at EIA Phase.

8.2. More on Potential Key or Significant Impacts

Further to the above issues, the following key environmental impacts emerged as the more pertinent and substantive issues either as raised by the interested and affected parties, or through the site assessment.

8.2.1. Impact of Vegetation Loss and Disturbance of Habitats

The installation of the solar photovoltaic modules arrays, and associated infrastructure is likely to results into loss of vegetation and disturbance of habitats, and this can consequently affect, alter and/or fragment ecosystems on the site. Although some parts of the site have already been transformed or disturbed through agriculture, there are still areas which may be still intact and active ecosystems on the site. These important habitats could be affected if due care in the planning and implementation mitigation measures to avoid negative impacts is not taken during the project phases. The tables below show the total area of vegetation or land cover to be cleared for the various infrastructures on site during the construction period.

Table 3: Area for Internal Roads

SITE AREAS	AREA IN HECTARES
Internal Road	90.6
Solar PV Panels	149.1
Assembly Areas	8.5
Laydown Areas	8.2
Delivery Areas	0.4
Office Area	1.1
Meteorological Station Area	1
Site Boundary	287.8

A breakdown of the main project areas which will require clearing, From the above it clear that a significant amount of vegetation or land cover will be cleared during construction; a total of approximately **258.3 Hectares out of the total Site Boundary of 287.8 hectares** of land.

A full detailed Ecological (Fauna and Flora) Impact Assessment will be undertaken during the EIA phase in order to assess the significance of noise impact on the identified potential noise receptors.

8.2.2. Visual Impact

Landscape perceptions and visual impacts are key environmental issues in determining Solar Energy Facility applications as landscape and visual impacts are by nature subjective and changing over time and location. The photovoltaic modules depending on the location and topographical features, have the potential of attracting people's attention. PV Solar facilities spread on the territory may become dominant points on the landscape, and may cause negative landscape and visual effects. The key features of these facilities including (location, landscape, size, height, number, material and colour), access and site tracks, substation buildings, compounds, grid connection, anemometer masts, and transmission lines, are critical to determining the visual impact. However an important characteristic of these facilities is that they permanently transform only a very small footprint, so the area where the PVs have been located can return to its original condition after the decommissioning phase.

Some of the techniques commonly used to inform the landscape and visual impact assessment are:

- Zone of Theoretical Visibility (ZTV) maps define the areas from which a wind plant can be totally or partially seen as determined by topography;
- These areas represent the limits of visibility of the plant;
- Photographs to record the baseline visual resource;
- Diagrams to provide a technical indication of the scale, shape and positioning of the proposed wind development; and
- Photomontages and video-montages to show the future picture with the wind & Solar Energy Facility installed.

Mitigation measures to prevent and or minimize visual impact on landscape can be devised.

The proposed project is located in an area that is very rural in nature, and is likely to have a notable visual and aesthetic impact on the landscape. The significance of the visual and aesthetic impact will be investigated and assessed during the EIA Phase.

8.2.3. Noise Impact

Apart from the construction phase, the operation of the proposed Solar PV project is not likely to generate any significant Noise. Therefore in this case we do not consider Noise as a significant potential aspect and hence no detailed Noise Impact Assessment will be undertaken during the EIA phase.

8.2.4. Impact on Birds and Bats

Solar Energy PVs are also not generally associated with negative impacts on birds and bats, unless there is overhead powerlines, which may represent a risk to both resident and migratory birds. However the construction phase may pose some impacts such as:

- Habitat disturbance: Construction and maintenance work can displace birds from preferred habitats and the breeding success rate may he reduced;
- Interference with birds' movements between feeding, wintering, breeding and molting habitats, could result in additional flights consuming more energy; and
- Reduction or loss of available habitat.

The impacts of birds cannot be generalized for several reasons:

- Impacts are very site-dependent (depending on landscape topography, wind farm layout, season, types of resident and migratory birds in the area, and soon).
- Impacts vary among the different bird species.

In the case of this project these impacts are anticipated to be very low since most of the electrical reticulation shall be underground. The area is also already crisscrossed by a number of high voltage and medium voltage lines and hence the contribution of the project is not likely to be significant at all.

8.2.5. Impact on Land use and Value

From a land use point of view, the key questions that need to be answered are whether the project:

- Is compatible with existing or planned adjacent uses;
- Whether it will negatively modify the overall character of the surrounding area;
- Whether it will disrupt established communities, and
- Whether it will be integrated into the existing landscape.

Given the location of the proposed Solar Facility Land use may be change through the introduction of the Project, and could trigger potential growth of similar project in the area which might have a accumulative negative impact on land value, agricultural potential, visual impact etc. The significance of these impacts would cumulative and a function of the amount of development attracted to the area.

It is assumed that the land use within the immediate vicinity the Project would continue to be agricultural in nature e.g. grazing and that the level of cumulative impact of the projects on the environment would be minimal. This issue has been addressed by the rezoning application prepared by a professional town and regional planner. The impact assessment of this issue and any further studies (if needed) shall be conducted during the EIA Phase.

8.3. Cumulative and Indirect Impacts

This section describes the likely cumulative impacts of the project on the environment. It identifies the scope of the assessment, the potential cumulative environmental effects, which might require associated mitigation measures to be addressed during the EIA phase.

8.3.1. Cumulative Impacts

Cumulative impacts are those Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project (EU, 1999).

The table below shows the various impacts, which shall be considered for cumulative impact assessment.

Table 4 Potential Cumulative impacts

Potential Impact	Residual Impact after mitigation	Considered for potential cumulative impact
Air Quality	Minimal	No
Archaeology and Cultural Heritage.	Minimal	No
Paleontological	Minimal	No
Avian	Low	Yes
Bats	Low	Yes
Flora	Minimal	No
Fauna	Minimal	No
Surface and Groundwater	Minimal	No
Visual impact	Low - Medium	Yes
Noise Impact	Low - Medium	No
Surface and Groundwater	Minimal	No
Traffic	Minimal	No
Land use	Low - Medium	Yes
Local Economy	Low - Medium	Yes
Health and Safety	Minimal	No
Telecommunications and Civil Avian	Low	Yes
Tourism	Minimal	Yes

8.3.2. Indirect Impacts

Indirect Impacts on the environment are those impacts, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts.

One indirect negative impact of wind energy facilities is a possible reduction in the available area for nesting and feeding by birds avoiding wind farm installations. During construction, species can be displaced from their original habitat, but in most cases they return during the operational phase. However, exclusions may occur for other species during the breeding period. The proposed project will not only supply renewable electricity to grid, but also contribute to the sustainable development of the local community. This includes the supply of zero-emitting renewable energy to the national grid, saving the coal and water resources and improving the local energy infrastructure. Very few direct new jobs will be created by wind and solar energy during their operation. However, both skilled and unskilled labour is required during the construction of supporting service infrastructure, such as the roads.

9. PUBLIC PARTICIPATION PROCESS

The EIA Regulations specify that a public participation process must be conducted as an integral part of the EIA. This chapter outlines the public participation process followed during the Scoping Phase of the Environmental impact Assessment for the proposed Canyon Springs Wind and Solar Facility. The aim and purpose of the public participation process was to:

- Ensure all relevant Key stakeholders and Interested and Affected Parties (I&APs) have been identified and invited to engage in the scoping phase;
- Raise awareness, educate and increase understanding of stakeholders about the proposed project, the affected environment and the environmental process being undertaken;
- Create a platform for Key stakeholders and I&APs to freely communicate and issues or concerns and suggestions for enhancing potential benefits and/or to prevent or mitigate impacts;
- Accurately document all opinions, concerns and queries raised regarding the project; and
- Ensure the issues and concerns of the stakeholders and I&APs related to the project are addressed in an adequate manner.

9.1. Identification of Key Stakeholders and Registration of I&APs

The first step of the PPP was to try and identify the key stakeholder and I&APs, and to create a registration database, which will be used for ongoing communication during the course of the EIA process. The identified stakeholders and I&APs were encouraged to registered their interest, concerns and issues in writing, so that these can be included in the submissions made to the competent authority as part of the Scoping Report.

The following summarizes the methods used to identify and notify the key stakeholders in the project:

- Placement of Site notices;
- Preparation and Distribution of a Background Information Document;
- Placement of a Newspaper Advertisement;
- Consultation with the Local Ward Councilor and community leaders;
- Consultation with Local Authority and Magisterial District Authority;
- Win-Deed Search for surrounding and neighboring landowners;
- Notification of Neighboring by Telephonic/Facsimile and email communication;
- Review of other database for projects done in the area;
- Our local knowledge of the area;
- Public Meeting; and
- Completion of Comments and Issues register.

Background Information Document

A Background Information Document (BID) which briefly describes the proposed project and provides information on how to participate as an I&AP, was prepared in Afrikaans and English the 2 predominant

languages in the study area. The BID was distributed to all surrounding land owners and identified and registered I&APs and stakeholders. A copy of the BID is included in **Appendix 3.** The BIDs were also placed at the Petrusville Library and the Municipality.

9.1.1. Site Notices

Site Notices were prepared in both English and Afrikaans and were placed on the fence of the proposed development site and public places in Petrusville. A notice was placed right opposite main ROAD shop, which is frequented by the majority of the local communities.

AANSLAGBILJET VAN OMGEWINGSIMPAK
VIR DIE VOORGESTELDE SWARTWATER 75 MW SONKRAG-FOTOVOLTAÏESE FASILITEIT IN PETRUSVILLE BINNE DIE RENOSTERBURG PLAASLIKE MUNISIPALITEIT
DEA REF No. 14/12/16/3/3/2/564

Kennis word hiermee gegee kragtens Regulasie 56(2) gepubliseer onder Staatskennisgewing GN R.385 onder hoofstuk 5 van die Wet op Nasionale Omgewingsbestuur (Wet 107 van 1998) van die voorneme van die aansoeker AE AMD Renewable Energy (Pty) Ltd om 'n aansoek in te dien vir Omgewingsmagtiging (Environmental Authorization) vir die volgende aktiwiteit:
Om 75 MW sonkrag-fotovoltaïese energie-fasiliteit te vestig. Dié voorgestelde hernubare energie-fasiliteit gaan ontwikkel word op Gedeelte 7 en 9 van De Put Plaas 73, geleë 14 km suidwes van Petrusville Dorp in die Noordkaap Provinsie. Die ontwikkeling sal die konstruksie van 'n aantal EIA-gelysde aktiwiteite insluit, insluitende: Paaie, kragdrade, kragopwekker PV Modules, die verwydering van plantegroei en ander gepaardgaande infrastruktuur.

UITNODIGING OM DEEL TE NEEM

Almal wat deur die voorgestelde konstruksie en ontwikkeling geraak word of wat daarin belangstel om kommentaar te lewer ("Interested and affected party" of I&AP), word hiermee uitgenooi om hul opmerkings, kwessies en besorgdhede onder die aandag van die kontakpersone te bring voor 30 Augustus 2013.
Alle geregistreerde I&AP's en belanghebbendes sal in kennis gestel word van die datum en tyd van 'n vergadering waar verdere inligting bekend gemaak sal word (Public Information Sharing Meeting).

Omgewingskonsultant:
Vir aandag: Mr. Steve K Kalule
USK Environmental & Waste Engineering (Pty) Ltd
Tel: 011 704 6433, Fax 043 748 1114 / 086 2703976
Email: kkalule@uskconsulting.com

USK Consulting

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE PROPOSED SWARTWATER 75MW SOLAR PHOTOVOLTAIC POWER FACILITY IN PETRUSVILLE WITHIN RENOSTERBURG LOCAL MUNICIPALITY
DEA REF No. 14/12/16/3/3/2/564

Notice is given in terms of Regulation 56(2) published under Government Notice GN R.385 under chapter 5 of the National Environmental Management Act, (Act 107 of 1998), of the Intent the proponent AE AMD Renewable Energy (Pty) Ltd to submit an application for Environmental Authorization for the following activity:
To establish a 75 MW Photovoltaic Solar Energy Facility. This proposed renewable energy facility is to be developed on Portions 7 and 9 of De Put Farm 73 located 14 Km Southwest of Petrusville Town in Northern Cape Province. The Development will including construction of a number of EIA listed activities including: Roads, Power Transmission Lines, Power Generation PV Modules, Clearing of Vegetation and other associated infrastructure.

INVITATION TO PARTICIPATE

All Interested and Affected Parties are invited to register their comments, issues and concerns in the above development, with the contact persons below before the 30th of August 2013.
All registered I&APs and stakeholders will be notified of the date and time of the Public Information Sharing Meeting.

Environmental Consultant:
Attn: Mr. Steve K Kalule
USK Environmental & Waste Engineering (Pty) Ltd
Tel: 011 704 6433 Faxes 043 748 1114 / 086 2703976
Email: kkalule@uskconsulting.com

USK Consulting

Figure 26 Site Notices placed at a public place along main road in Petrusville

Figure 27 Site Notices placed at a public place along main road in Petrusville

Figure 28 Site Notices placed along the fence of the Swartwater Farm

9.1.2. Newspaper Advertisements

A Notice and advertisement of the EIA process for the proposed development was placed in the Regional Newspaper, The Echo on the 5 July 2013. The Echo is the main print Media for that region of the Northern Cape Province. The purpose of the advertisement and site notice is to notify the public about the proposed project and to invite them to register as I&APs.

9.2. Windeed Search and Notification of Neighbouring Land Owners

Due to the very limited response to the site notices, BIDs, and newspaper advertisement, a WinDeed search on Deeds Office and Surveyor General Office databases information and contact details of

landowners of surrounding and neighboring farms to the project site summarized in the table below.

Table 5 Surrounding and Neighbouring Farm Owners Notified of the EIA Process

Farm Owner	Farm Name	Mobile Phone	Home Line	Email
Jopie Fourie	Bermuda	083 736 6073	083 4148028	jopiemiki@gmail.com
Koos Bester	Perdeberg	073 808 7353	053 665 7201	vlakplaas@gmail.com
Koos Bester	Governia	073 808 7353	053 665 7201	vlakplaas@gmail.com
Koos du Preez	De Put	083 662 3698	053 4741102	dupreezretha@yahoo.com
Koos du Preez	Johannaoord	083 662 3698	053 4741102	dupreezretha@yahoo.com

9.3. Authorities and Stakeholder Consultation

A number of stakeholder and authorities were contacted and notified of the proposed development and were requested to submit their comments to the EAP by 30th July 2013, as follows:

Northern cape department of environment and nature conservation
Department of Agriculture, Forestry and Fisheries: Directorate Land Use and Soil
Department of Water Affairs (DWA): Deputy Director Lower Orange WMA;
South African Heritage Resources Agency;
Northern Cape Provincial Heritage: Boswa ya Kapa Bokone;
Pixley ka Seme District Municipality;
Renosterberg Local Municipality; and
Eskom (Regional office).

9.4. Public Meetings

A public meeting/s shall be held at Petrusville if there is sufficient interest from Interested and Affected Parties. Notice to this effect has been included in the site notices and the newspaper advertisements. The purpose of these meetings shall to present the Draft Scoping Report to the I&APs and allow them an opportunity to comment on it, as well as to document and discuss any issues which the public wishes to raise. Minutes of all meetings held with I&APs and will be included in the Final Scoping Report.

9.5. Public Review Period

The draft scoping report has been made to the public for review from the 15th July to 30th August 2013. The report has been placed at the following public places for ease of access at Petrusville Public Library
A copy has also been placed on the USK Consulting website: www.uskconsulting.com/Publiicreview Key Stakeholders and I&APs have been informed of the placement of the DSR and reminded to submitted any comments before the 30th August 2013.

9.6. Issues and Comments Report

A comments and issues report will be prepared and this will detail all the comments raised during the public participation process described above. These issues will be addressed in the final scoping report and IAPs and stakeholders will be notified accordingly.

9.7. Comment on the Public Participation Process

The Public Participation Process shall be conducted in accordance with the EIA Regulations, 2010, and Guidelines for Public Participation DEA, 2006. However it was noted that the general interest in the project from stakeholders and I&APs was surprisingly very low to date. This could be attributed to the fact that the project is located in a rural and low-income area, with low population levels. The public participation process will continue to be used a platform to create awareness to the community.

10. PLAN OF STUDY FOR EIA

The proposed development requires an EIA in accordance with the EIA Regulations, 2010. The EIA follows the preparation of a Scoping Report; the purpose of which was to identify the range of environmental impacts that may be associated with the proposed upgrade, alternatives, and the focus of the EIA. This section presents the proposed approach to the EIA for the proposed upgrade and has been structured as per Section 28(1)(i) of the EIA Regulations, 2010.

The specific objectives of the EIA Phase shall be to:

- Continue to consult with and inform all relevant stakeholders and Interested and Affected Parties (I&APs);
- Compare the various project alternatives;
- Investigate salient environmental issues and their related impacts through specialist studies; and
- Assess the identified impacts and recommend appropriate mitigation measures for the proposed development.

10.1. Key Issues to be addressed during the EIA Phase

A number of potential positive and negative impacts of the project were identified during the Scoping Phase. These potential impacts are likely to come about during the 3 main phases of the project life cycle namely **construction phase:** these impacts are likely to be mainly localized and generally of medium significance if un-mitigated, but could be reduced to low significance if mitigation measures and environmental management good practices are implemented; Operational phase: which are likely to be the more significant and substantive impacts, with some cumulative and indirect impacts; and Decommissioning Phase: very similar to operational phase impacts in that they will be generally localized and of medium to low significant impacts.

These issues will be addressed in detail during the EIA Phase and in particular the more significant issues identified during the Scoping phase, which shall be investigated by specialists, and these include:

- Ecological (Fauna and Flora) Impacts;
- Aesthetic, Visual and Landscape Impacts
- Agricultural and Soils and Land Use Impacts
- Archaeological/Heritage Impacts
- Paleontological Impact Assessment
- Social and Economic Impacts

10.2. Specialist Studies

Typically during the EIA phase specialists may be required to undertake further specific investigations on the key issues identified during the scoping phase. The Specialist studies then form part and parcel of the EIA Report and informants of the impact statement. In the case of this Scoping and EIA for the proposed Swartwater Solar PV Project, the following Specialist studies will be undertaken:

- Ecological (Flora and Fauna) impact Assessment
- Paleontological Impact Assessment
- Heritage and Archaeological Impact Assessment
- Visual Impact Assessment
- Social Impact Assessment
- Agricultural and Soil Impact Assessment

The following specialists and specialist studies have been appointed to undertake the specialist studies during the Environmental Impact Assessment Phase.

Specialist Field	**Specialist Name**
Ecological (Flora and Fauna) Assessment	Marius Van Der Vyver
Heritage/ Archaeological Impact Assessment	Dr. Anton Von Vollenhoven
Visual Impact Assessment	Joshua De Bruin
Paleontological Impact Assessment	Dr. Robert Gess
Agricultural / Soil Impact Assessment	Dr. Louis Du Pisani
Social Impact Assessment	Dr. Kamoga

10.3. Terms of Reference for Specialist Studies

10.3.1. General Terms of Reference

The above identified specialist studies shall at the minimum adhere to the following Terms of Reference while conducting their studies:

- Address issues raised by I&APs, as contained in the Comments and Response Report, and conduct an assessment of all potentially significant impacts.
- Any additional issues that have not been identified during Scoping should also be highlighted to the EAP for further investigations.
- Approach to include desktop study and site visits, as deemed necessary, to understand the affected environment and to adequately investigate and evaluate salient issues. Indigenous knowledge (i.e. targeted consultation) should also be regarded as a potential information resource.
- Assess the impacts (direct, indirect and cumulative) in terms of their significance (using suitable evaluation criteria) and suggest suitable mitigation measures. In accordance with the mitigation hierarchy, negative impacts should be avoided, minimized, rehabilitated (or reinstated) or compensated for (i.e. offsets), whereas positive impacts should be enhanced. A risk-averse and cautious approach should be adopted under conditions of uncertainty.
- Consider time boundaries, including short to long-term implications of impacts for project life-cycle (i.e. pre-construction, construction, operation and decommissioning).
- Consider spatial boundaries, including:
  - Broad context of the proposed project (i.e. beyond the boundaries of the specific site);
  - Off-site impacts; and
  - Local, regional, national or global context.

- The provision of a statement of impact significance for each issue, which specifies whether or not a pre-determined threshold of significance (i.e. changes in effects to the environment which would change a significance rating) has been exceeded, and whether or not the impact presents a potential fatal flaw or not. This statement of significance should be provided for anticipated project impacts both before and after application of impact management actions.
- Recommend a monitoring programme to implement mitigation measures and measure performance. List indicators to be used during monitoring.
- Appraisal of alternatives (including the No-Go option) by identifying the Best Practicable Environmental Option (BPEO) with suitable justification.
- Advise on the need for additional specialists to investigate specific components and the scope and extent of the information required from such studies.
- Engage with other specialists whose studies may have bearing on your specific investigation.
- Present findings to the EAP project team, where key discussion points will include the evaluation of alternatives, recommended management measures and monitoring programme.
- Present findings and participate at public meetings, where EIA Report is to be presented to I&APs.
- Information provided to the EAP needs to be signed off.
- Review and ensure that specialist information has been interpreted and integrated correctly into the EIA report.
- The appointed specialists must take into account the policy framework and legislation relevant to their particular studies.
- Use the assessment criteria for impact assessment and assigning significance.
- All specialist reports must adhere to section 32 ("specialist reports and reports on specialized processes") of the EIA Regulations published in Government Notice No. R543 (2010), as part of the EIA Report.

10.3.2. Ecological Impact Assessment (Fauna and Flora)

The Ecological (Flora and Fauna) Impact Assessment Specialist shall over and above the general terms of reference stipulated above, undertake:

- Undertake baseline survey and describe affected environment within the project footprint (including any alternatives and all associated infrastructure) from a biodiversity perspective.
- Take into consideration the provincial biodiversity conservation plan.
- Assess the current ecological status and the conservation priority within the project footprint and adjacent area (as deemed necessary).
- Provide a concise description of the importance of the affected area to biodiversity in terms of pattern and process, ecosystem goods and services, as appropriate.
- Undertake sensitivity study to identify protected species, Red Data species, alien species and medicinal species.

- Prepare a biodiversity sensitivity map with the use of a Geographical Information System (GIS), based on the findings of the study.
- Identify potential fatal flaws associated with the project and its alternatives from a biodiversity perspective.
- Use the assessment criteria for impact assessment and assigning significance.
- Prepare a report including mitigation measures for minimizing negative impacts.

10.3.3. Paleontological and Heritage Impact Assessment

The Paleontological Impact Assessment Specialist shall over and above the general terms of reference stipulated above, undertake:

- A Phase Paleontological Impact Assessment in accordance with the South African.
- Heritage Resources Act (No. 25 of 1999).
- Undertake baseline study (historical research, desktop and field study) indicating the Siting and location of Paleontological resources, the nature and degree of significance and the present physical condition.
- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study.
- Identify paleontological resources to be monitored.
- Use the assessment criteria for impact assessment and assigning significance.
- Prepare a report including mitigation measures for minimizing negative impacts.

10.3.4. Archaeological and Heritage Impact Assessment

The Archaeological and Heritage Impact Assessment Specialist shall over and above the general terms of reference stipulated above, undertake:

- A Phase 1 Heritage Impact Assessment in accordance with the South African Heritage Resources Act (No. 25 of 1999).
- Undertake baseline study (historical research, desktop and field study) indicating the siting and location of heritage resources, the nature and degree of significance and the present physical condition.
- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study.
- Identify archaeological or heritage resources to be monitored.
- Use the assessment criteria for impact assessment and assigning significance.
- Prepare a report including mitigation measures for minimizing negative impacts.

10.3.5. Agricultural and Soils Impact Assessment

The Agricultural and Soils Impact Assessment Specialist shall over and above the general terms of reference stipulated above, undertake studies to fulfil the requirements stipulated in the letter of acceptance of the application form issued by the Department of Environmental Affairs:

These requirements include:

- A detailed Soil analysis;
- Current Land Use on the site;
- Surrounding Land Use;
- Current status of land, erosion, vegetation cover, water availability etc;
- Description and Motivation of change or no change of land use from agriculture;
- Potential Alternative Land uses; and
- To obtain written comments on your report from the Department of Agriculture and Forestry contact person as indicated in the attached caption from the Acceptance of the EIA Application as issued by the Department of Environmental Affairs

10.3.6. Other Specialist Studies

The Social Impact Assessment and the visual impact assessment Specialist studies shall over and above the general terms of reference stipulated above, however these shall be in forms of screening level impact assessments as these issues have been considered to be important but not critical or significant potential impacts.

10.4. Impact Assessment Criteria and Methodology

For the purpose of assessing, rating and assigning significance to the potential impacts, an impact assessment criteria has been developed. The assessment of impacts shall be based on the EAP's and specialists' expertise, professional judgment, field observations and desktop analysis.

The criteria for assessing the identified potential environmental impacts or impact prediction, aims at providing a basis for determining the likely significance of each impact. This involves the use of any number of recognised methods to forecast the significance of the potential impacts. In order to assess the potential impacts as objectively as possible the following assessment criteria will be used:

10.4.1. Magnitude or Severity of Impacts

This criterion considers the severity of the impact in terms of how it impacts on the receiving environment, taking into account the degree to which the impact may irreversible damage or loss to the resource.

Table 6: Magnitude or Severity

Rating	Definition of Rating	Score
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way.	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
Very High	Resulting in irreversible change or permanent loss.	4

10.4.2. Spatial Scale of Impacts

This criterion considers the extent of the impact in terms of the spread of the impact, area covered, volume and distribution.

Table 7: Spatial Scale

Rating	Definition of Rating	Score
Localized	Site specific or confined to project footprint.	1
Regional	Extending beyond the boundaries of the project site and its buffer zone, affecting neighbours, town, local authority, district and even province.	2
National	Affecting areas beyond the province, and country.	3
International	Affecting areas beyond the country's borders.	4

10.4.3. Duration of Impacts

This criterion considers the duration of the impact in terms of the persistence of the impact.

Table 8: Duration Scale

Rating	Definition of Rating	Score
Short Term	Short term / will disappear with mitigation or completion of phase, or up to 2 years.	1
Medium Term	Medium Term/ Persists beyond one phase but can be negated afterward. Typically more than 2 years but less than 15 years.	2
Long Term	Long Term / Life of the facility but will be mitigated directly or by natural processes, or more than 15 years.	3
Permanent	Beyond facility's lifespan and/or no form of mitigation can result in the impact to be considered transient.	4

10.4.4. Consequence of Impacts

The total consequence of any given impact is obtained by adding the severity, spatial scale and duration figures i.e. **Total Consequence = (Magnitude + Spatial Scale + Duration).**

Table 9: Consequence scoring matrix

	Magnitude				
Spatial Extent	3	4	5	6	Duration
	5	6	7	8	
	7	8	9	10	
	9	10	11	12	

Where:

Very Low	Low	Medium	High	Very High
3 – 4	5 – 6	7 – 8	9 – 10	11 – 12

10.4.5. Probability of Activity

This criterion considers the probability of the occurrence of the activity leading to the potential impact.

Table 10: Probability of Activity

Probability	Definition
Improbable	<40% chance of occurring
Possible	>40%>70% chance of occurring
Probable	>70% <90% chance of occurring
Definite	>90% chance of occurring

10.4.6. Significance of Impacts

In this method the significance any given impact is predicted as a product of the consequence and the Probability of that impact as per the example in the table below:

Table 11: Significance Rating

Significance Rating	Consequence	Probability
Insignificant	Very Low	Possible
	Very Low	Improbable
Very Low		
Low		
Medium		
High		
Very High		

10.4.7. Impact Rating Matrix

The matrix table below illustrates the summary of the results of the assessment for each Activity and impact. A full Impact assessment Sheet is included.

Table 12: Impact Rating Table

Nature of Impact			
Affected Environment			
Nature of Impact			
Consequence	Magnitude/Severity		
	Spatial Scale/Extent		
	Duration		
Probability	Probability of impact		
Significance	With Mitigation		
	Without Mitigation		
Confidence			

Mitigation of Impacts[1] - This section only highlights some of the mitigation measures. Detailed mitigation measures are outlined in the Environmental Management Plan.

[1] Mitigation of impacts in this report takes the following approach **Avoiding or preventing** the impact through the early consideration of opportunities and constraints and development alternatives (positive planning) and by modifying the proposal accordingly; **Reducing or minimizing** negative impacts and maximising benefits, by considering alternatives and modifying the proposal; **Rectifying** negative impacts by restoring the affected environment to its previous condition, or rehabilitating it for a different land use; and As a 'last resort', **providing an offset to compensate** for the residual negative impact on biodiversity or ecosystem services, by replacing or providing 'like for like or better' substitutes for these impacts. In cases where residual impacts affect threatened, unique or irreplaceable biodiversity, offsets are not an option as substitutes do not exist.[1]

10.5. Environmental Management Plan

An Environmental Management Plan will be compiled in accordance with Regulation 33 of Government Notice R543. The EMP will form an appendix to the EIR and will provide practical management measures to be introduced in order to ensure that impacts as a result of the proposed upgrades are minimized and prevented where possible. The EMP will include a detailed construction and Operational and Maintenance Plan for the new wind and solar facility shall be prepared and submitted together with the EIA. At the minimum this must include the following:

- Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that are identified in the Environmental Impact Report (EIR), including environmental impacts or objectives in respect of planning and design, pre-construction and construction activities, operation or undertaking of the activities, rehabilitation of the environment and closure where relevant;
- A detailed description of the aspects of the activity that are covered by the draft EMP;
- An identification of the persons who will be responsible for the implementation of the measures;
- Proposed mechanisms for monitoring compliance with the EMP and reporting thereon;
- As far as possible, measures to rehabilitate the environmental affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including where appropriate concurrent or progressive rehabilitation measures;
- A description of the manner in which it intends to modify, remedy activities causing pollution or environmental degradation and how it will comply with prescribed environmental management standards and provision of any relevant Acts;
- Time periods within which the measures contemplated in the EMP must be implemented;
- The process for managing any environmental damage, pollution, ecological degradation as a result of undertaking a listed activity;
- An environmental awareness plan describing the manner in which the applicant will inform his or her employees of environmental risk and how risk must be dealt with to avoid pollution; and
- Where appropriate, closure plans, including closure objectives.

10.6. The content of the EIA Report

The EIA report shall be prepared in accordance with the minimum information requirements and structure as set out in the EIA regulations, 2010 (GN: 543) as follows:

- Details and expertise of the EAP to undertake an EIA;
- Detailed description of the proposed activity;
- Detailed description of the property on which the activity is to be undertaken and the location of the activity on the property;

- A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;
- Details of the PPP conducted during the detailed assessment phase of the EIA process;
- A description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;
- An indication of the methodology used in determining the significance of potential environmental impacts;
- A description and comparative assessment of all alternatives identified during the environmental impact assessment process;
- A summary of the findings and recommendations of any specialist report or report on specialised process;
- A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issues could be addressed by the adoption of mitigation measures;
- An assessment of each identified potentially significant impact in terms of cumulative impacts, the nature of the impact, the extent and duration of the impact, the probability of the impact occurring, the degree to which the impact can be reversed, the degree to which the impact may cause irreplaceable loss of resources and the degree to which the impact can be mitigated;
- A description of any assumptions, uncertainties and gaps in knowledge;
- A reasoned opinion as to whether the activity should or should not be authorized, and if the opinion is that it should be authorized, any conditions that should be made in respect of that authorization;
- An environmental impact statement which contains a summary of the key findings of the environmental impact assessment, a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;
- A draft Environmental Management Plan (EMP);
- Copies of any specialist reports and reports on specialized processes; and
- Any specific information that may be required by the competent authority.

11. CONCLUSION

In conclusion, although there are no environmental fatal flaws identified during the Draft Scoping Phase, there are a number of potentially significant environmental impacts that require the attention of specialists in the specific fields. A detailed Environmental Impact Assessment is therefore required to further investigate and assess these potential impacts and to recommend appropriate mitigation measures where required.

Thank You,

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