
PROPOSED AMANDLA WELANGA SOLAR ENERGY FACILITY, NORTHERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the draft Basic Assessment Report
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Prepared for

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PROJECT DETAILS

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Draft Environmental Management Programme:
Proposed Amandla Welanga Solar Energy Installation
on a site near Noupoort, Northern Cape Province
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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

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

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

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;

- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

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

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

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

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

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

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

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

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

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened

Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

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PURPOSE AND OBJECTIVES OF THE EMP

CHAPTER 1

An Environmental Management Programme (EMP) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced.”¹ The objective of this EMP is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMP is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

This EMP is applicable to the proposed establishment of the Amandla Welanga Solar Energy Facility on a site near Noupoort, Northern Cape. It provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site remediation (i.e. soil stabilisation, re-vegetation), during operation and decommissioning (i.e. similar to construction phase activities).

This EMP has been compiled in accordance with Section 33 of the EIA Regulations of June 2010 and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMP has the following objectives:

- » Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation,

¹ Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

operation, and decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility.

- » Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
- » Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the Basic Assessment process.

The management and mitigation measures identified within the Basic Assessment process are systematically addressed in this EMP, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Amandla Welanga Solar Energy (herein referred to as “The Developer”) must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits issued for the proposed project, as well as to obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMP and through its integration into contract documentation for the construction and operation of the proposed PV facility. Since this EMP is part of the Basic Assessment process it is important that this document be read in conjunction with the draft Basic Assessment Report (April 2012) as well as with the Environmental Authorisation (once issued). This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental management process. This EMP for construction and operation activities has been compiled in accordance with Section 34 of the Environmental Impact Assessment (EIA) Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. Should there be a conflict of interpretation between this EMP and the Environmental Authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMP, unless otherwise agreed by the authorities in writing. Similarly, any provisions in current legislation overrule any provisions or interpretations within this EMP.

To achieve effective environmental management, it is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the

environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

- » Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the power line.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Providing basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on/off the site.
- » Ensuring awareness of any other environmental matters, which are deemed necessary by the ECO.

This EMP shall be binding on all the parties involved in the construction and operational phases and shall be enforceable at all levels of contract and operational management within the project.

PROJECT DETAILS

CHAPTER 2

Amandla Welanga Solar Energy (Pty) Ltd is proposing the establishment of a Photovoltaic (PV) solar energy facility for the purpose of electricity generation. The project is referred to as the **Amandla Welanga Solar Energy Facility**. The facility will be established over an area of <20 ha on a site ~ 26 km north of Noupoort, Northern Cape. The Amandla Welanga Solar Energy Facility is proposed on the Remaining extent of Farm Rietfontein 140. A locality map showing the extent of the site is illustrated in **Figure 1**.

The project will have a maximum generating capacity of up to 20 MW, which will be evacuated into the national electricity grid as part of a power purchase agreement with Eskom and South African Treasury. The purpose of the proposed facility is to sell the electricity to Eskom as part of the Renewable Energy Independent Power Producers (IPP) Procurement Programme. The IPP Procurement Programme has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities by IPPs. Selling of electricity according to the IPP Procurement Programme has the advantage of giving developers long-term stability and predictability.

The proposed facility would have a generating capacity of up to 20MW and would comprise:

- » Arrays of photovoltaic panels with;
- » Cabling between the project components, to be lain underground where practical;
- » Inverters and transformers(which make up the substation)
- » An 66kV overhead power line (200m in length) feeding into the Eskom electricity network at Fontein Substation which is located on the Amandla Welanga site;
- » Internal access roads; and
- » Workshop area for maintenance and storage.

The layout of the facility is shown on the topographical map - **Figure 2**.

The components of the PV Facility are discussed in more detail below:

- » **Photovoltaic panels:** A photovoltaic (PV) cell is made of silicone which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

- » **The Support Structure:** The PV panels will be fixed to a support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics.
- » **Cables** between the PV panels: Underground cables from the arrays of panels will feed into the invertors.
- » **Inverters:** The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current. Approximately 16 inverters will be required for an ~16 MW facility.
- » One 300m 66kV **overhead power line** to connect to the Fontein Substation
- » Internal access **roads** (between 3 – 4m wide, 200 m in length)
- » **Office / Workshop:** The workshop area (0.1 ha, 13-20m long, 6-12m wide, 3-4m high) will be used for storage and employees during the operational life of the

A summary of the technical specification of the PV Facility is shown below.

PV Technology	poly-crystalline
Installed capacity	16 MW
Panel Dimensions	1.67 x 1m (230Wp)
Number of Panels	69120
Number of inverters	16
Main Transformer capacity	9 x 1.6 MVA
Final Height of installed panels from ground level	3-4 m
Height of inverters	2.5 m
Height of Transformers	2.5 m
Height of Buildings	3 m
Height of Fencing	2 m
Total area used for the plant	~19.54 Hectares

The entire farm portion will not be used for the PV facility and the actual area to be occupied by the PV Facility will be 1 % of the farm portion (i.e. 19.6 hectares of a broader study area of 1302 hectares). The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

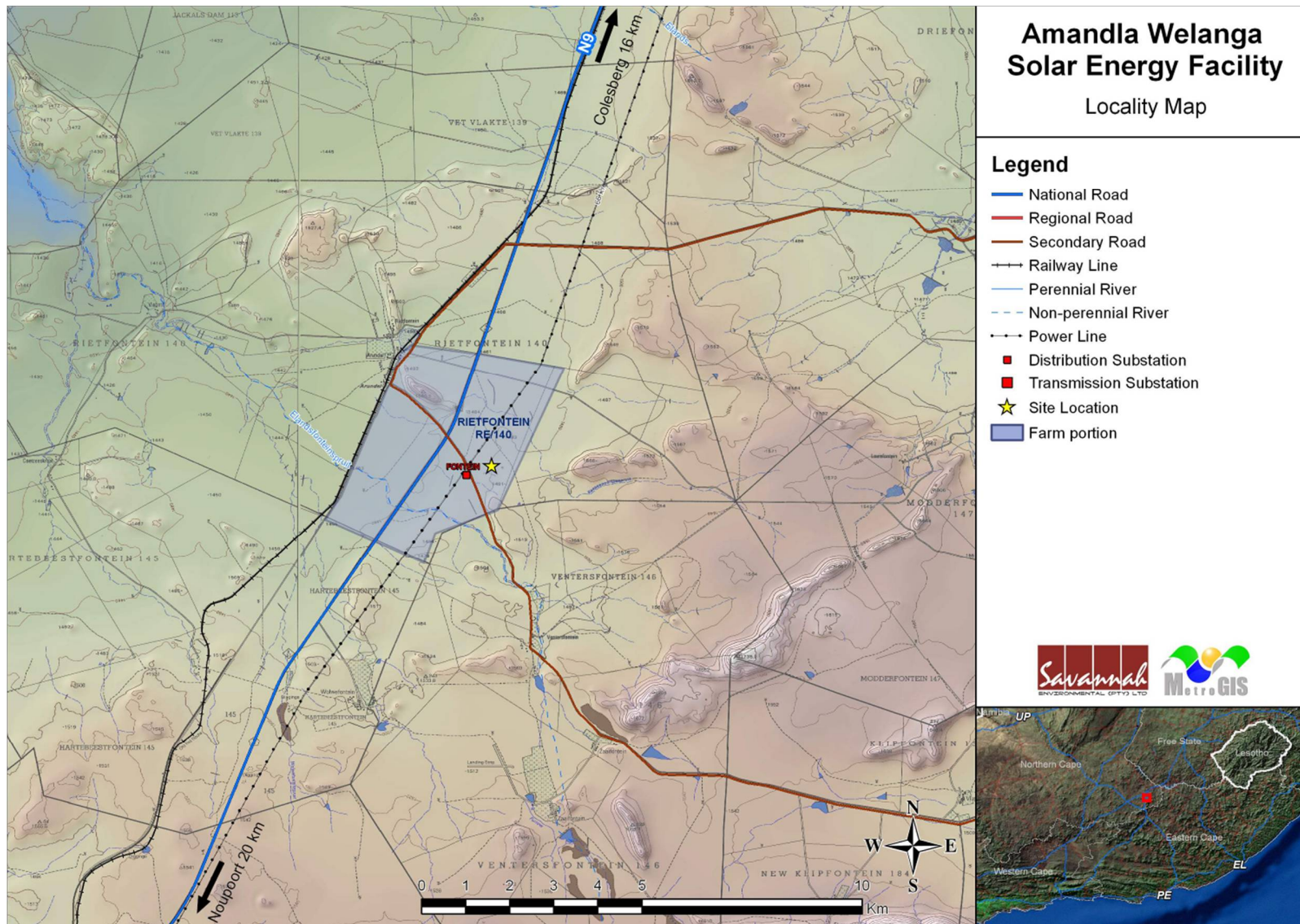


Figure 1: Locality map showing the broader study site identified for the proposed facility

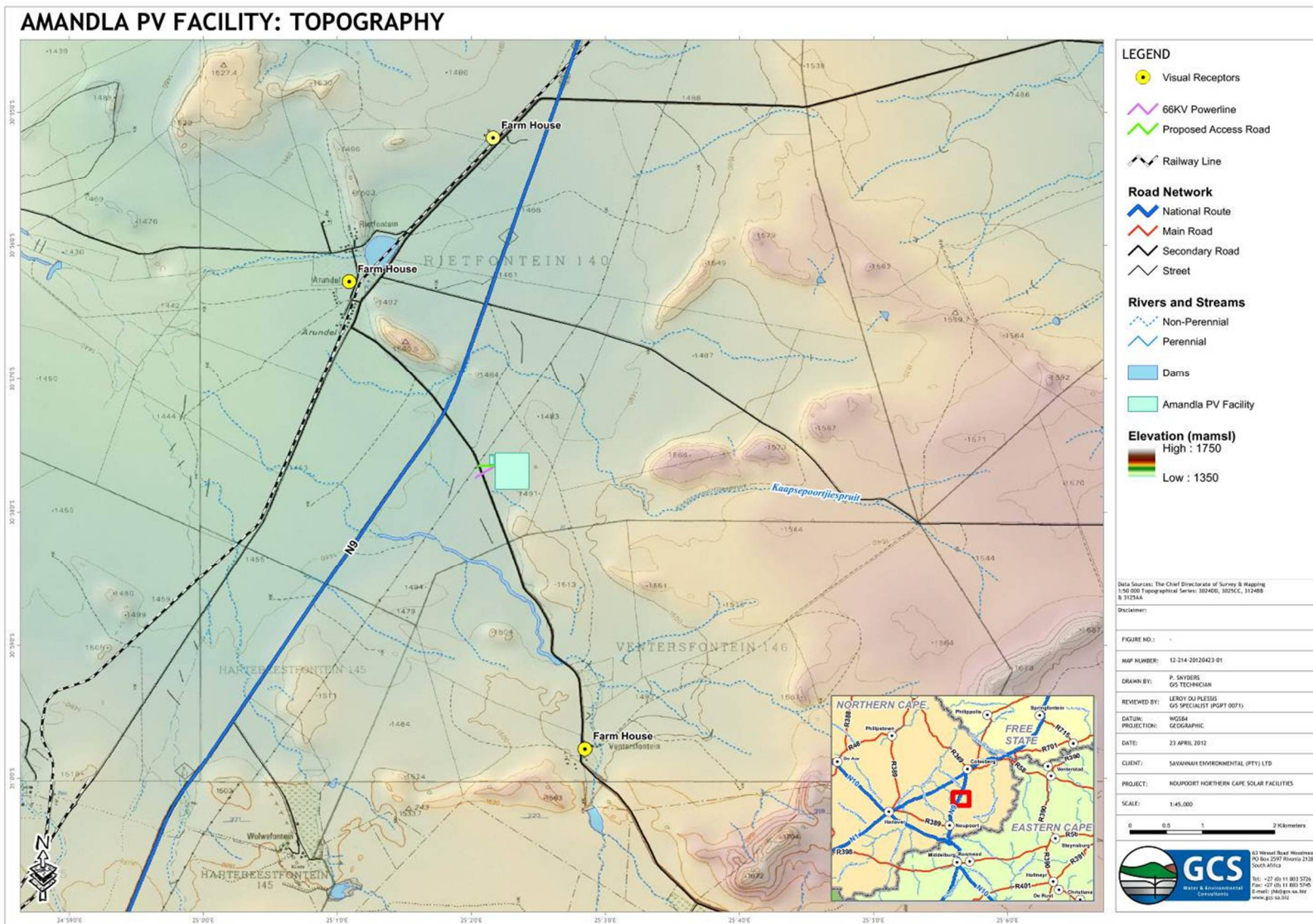


Figure 2: Topographical map showing the layout for the Proposed Amandla Welanga Solar Energy Facility

2.1 Activities and Components associated with the PV Plant

The main activities/components associated with the proposed facility are detailed in the tables which follow.

2.1.1. Construction Phase

Approximately 60-80 people are expected to be required during the construction phase which is expected to take place over a period of 6 – 9 months) of which 25% is estimated to be low skilled/semi-skilled positions, and 75% skilled. Low/semi-skilled positions will ideally be filled by locals living in and around Noupoort and potentially from places further afield such as Middleburg and Colesberg. Workers not living in the area, including those for skilled positions, will not be housed on site.

The following construction activities are expected to form part of the project's scope of works.

Table 1: Construction Activities Associated with the PV Facility

Activity	Description
Pre-construction surveys	<p>Prior to initiating construction, a number of detailed surveys will be required including, but not limited to:</p> <ul style="list-style-type: none"> » <i>Geotechnical survey</i> – a geotechnical survey will be required in order to detail the geology and topography of the study area. The geotechnical study will also consider flood potential, foundation conditions, and the potential for excavations. This study will serve to inform the Engineering, Procurement, and Construction (EPC) Contractors regarding soil conditions, required to specify foundations required for the support structures, and the extent of earthworks and compaction required in the establishment of any internal access roads. » <i>Site survey</i> – this will be required to finalise the design layout of the PV solar field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the facility.
Establishment of access roads	<ul style="list-style-type: none"> » The project development site is accessible from the N9 from Noupoort and subsequently via a secondary road which passes the Fontein Substation. » Temporary access roads may be required during the construction phase; however these are likely to be single track gravel roads of less than 4 m wide.

<p>Undertake site preparation</p>	<p>» Site preparation activities will include clearance of vegetation at the footprint of the following infrastructure within the development footprint:</p> <ul style="list-style-type: none"> * Support structure/pedestals for the PV panels. * Switchgear * Transformers (9 units for the facility). * Workshop * Trenches for the underground cabling. <p>These activities may require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.</p>
<p>Transport of components and equipment to site</p>	<p>» The components will be transported to site.</p> <p>» The following civil engineering construction equipment will be required on site (e.g. excavators, trucks, ready mix cement trucks, etc.) as well as components required for the establishment of the switchgear.</p>
<p>Establishment of a construction camps and laydown areas</p>	<p>» Once the required construction equipment has been transported to site, a dedicated equipment camp and laydown areas may be required. These will serve to confine activities and storage of equipment and/or fuel to designated area(s) to limit the potential ecological impacts associated with this phase of the project.</p> <p>» Fuel required for the on-site construction vehicles and the generator will need to be secured in a temporary bunded area within the construction camp(s) to prevent leakages and soil contamination.</p> <p>» Electricity required during the construction phase will be supplied via a generator.</p>
<p>Establishment of the PV panels</p>	<p>» The PV cells will be arranged in arrays.</p> <p>» The frames will be fixed onto the ground with the use of concrete / rammed into the ground, depending on the soil conditions, depending on the soil conditions at the site.</p> <p>» This will make the installation of the plant less invasive for the territory and facilitate the decommissioning at the end of its production cycle.</p> <p>» The height of the PV panel structure will be up to 4 m.</p> <p>» Inverters will be installed to facilitate the connection between the solar energy facility and the Eskom electricity grid.</p> <p>» The installation of underground cables between the</p>

		<p>PV panels, the transformers, the switchgear, will require the excavation of trenches of approximately 1 m deep within which they can then be laid.</p> <ul style="list-style-type: none"> » The erection of a substation (9 transformers and 18 invertors) and a short (150m) 66 kV overhead power line to loop in and loop out of the existing 66 kV power line which occurs on the site
Undertake site rehabilitation		<ul style="list-style-type: none"> » Once construction is complete and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. » On full commissioning of the facility any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.

2.1.2. Operation and Maintenance Phase

It has been estimated that 10 - 20 staff will be required on-site of for maintenance of the PV facility and to clean the panels (2 permanent and 18 contract). The facility is expected to be operational for 25 years.

The following operation and maintenance activities are expected to form part of the project scope of works.

Activity	Description
Operation of the PV panels and associated electrical infrastructure	<ul style="list-style-type: none"> » The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). » The inverters will change the power to alternating current, where after the electricity will be conveyed to the switchgear after being stepped up by the transformers and then evacuated into the grid via the overhead 66 kV powerline that occurs on the site.
Cleaning of the PV panels	<ul style="list-style-type: none"> » The PV panels will be cleaned once or twice per annum or more often if deemed necessary. » Water is likely to be sourced from the Umsombuvo Municipality and will be trucked to the site when required. » It is assumed that approximately 13 tankers (each tanker holding 30 000 litres) will be required for each cleaning session.
Site operation and maintenance	<ul style="list-style-type: none"> » Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.

2.1.3. Decommissioning Phase

The solar energy facility is expected to have a lifespan of 25 years (i.e. with routine maintenance). The power plant infrastructure would only be decommissioned and rehabilitated once it has reached the end of its economic life. It is most likely that decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

The following decommissioning and rehabilitation activities will form part of the project scope.

Activity	Description
Site preparation	Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and replace existing components	The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

2.2 Summary of Impacts and Finding of the Basic Assessment Report

Savannah Environmental has been appointed as the independent environmental consultants to undertake the Environmental Basic Assessment to identify and assess any potential environmental impacts. As part of these environmental studies, interested and affected parties (I&APs) have been actively involved through a public involvement process.

In terms of the findings of the Basic Assessment, various planning, construction, and operation-related environmental impacts were identified, including:

- » Potential impacts on one heritage artefact;
- » Social impacts;
- » Potential impacts on soil;
- » Ecological disturbances.

A summary of the assessment conclusions for the proposed development site is provided below. In doing so, it draws on the information gathered as part of the Basic Assessment process and the knowledge gained by the environmental consultants during the course of the process and presents an informed opinion of the environmental impacts associated with the proposed project, in no particular order:

- » The area is of a **low heritage and cultural sensitivity**. The heritage impacts will be of a low significance. There is two heritage artefact (Stone Age tool) that has been identified as part of this assessment on the footprint area of the site. This heritage site has been given a Grade III rating in terms of the NHR Act 25 of 1999, which means mitigation against negative impacts (damage) is required from SAHRA for the removal of this stone tool. Alternatively, the design of the PV facility to avoid the stone tool.
- » **Soil degradation (erosion)** has been identified as potentially significant for this site in the absence of erosion control. The soils on the site are susceptible to erosion and areas of high erosion and erosion control during construction and operational is essential, after which the **impact on soils is rated as a low significance**.
- » The site has been given a ranking of a **medium ecological sensitivity** (in terms of the vegetation, habitats that the site supports currently, animals, drainage areas and soils that occur on the site).
- » The agricultural potential of the site is low and therefore the **impact on existing livestock** grazing on the site **is low, on a regional scale**.
- » Social impacts include both positive (job creation) impacts and negative social impacts (community risks. Enhancement measures to increase positive impacts and mitigation measures to decrease negative impacts have been proposed in this report. **Social impacts** have been rated as having **medium-low significance**.
- » **Visual impacts** mainly from the PV panels and power line will be of a **low significance**.

The establishment of the facility will have positive benefits as the integration of an additional 20 MW of power generation may alleviate the pressure on the local grid to a small extent and would contribute (albeit small) to the national target for renewable energy.

There are no insurmountable environmental or social constraints that prevent the establishment of the proposed Amandla Welanga Solar Energy Facility. However, several sensitive areas / features were identified on the site, and are contained within this basic assessment report and are highlighted **below**. **The following environmental (and are shown in Figure 3)** for the proposed project, that require specific management action and should be included in the Environmental Authorisation (EA) for the project, in keeping with the principles of sustainable development, and balancing environmental, social and economic needs:

SENSITIVE FEATURE	IMPLICATIONS FOR PROJECT IMPLEMENTATION TO BE INCLUDED IN EA
» There are two heritage artefacts (Stone Age tools) that occur in the area of the proposed development of the PV facility.	» The detailed design to avoid placement of PV panels on the area where the stone artefact occurs. If this is not possible a

SENSITIVE FEATURE	IMPLICATIONS FOR PROJECT IMPLEMENTATION TO BE INCLUDED IN EA
<p>These heritage artefacts are from the Stone Age and Middle Stone Age. They have been given a Grade III rating in terms of the NHR Act 25 of 1999, which means mitigation against negative impacts (damage) is required, along with a permit for removal of these artefacts (from SAHRA).</p>	<p>permit for the removal of heritage artefacts will be required.</p> <ul style="list-style-type: none"> » If archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken. » Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.
<ul style="list-style-type: none"> » Areas of high soil erosion sensitivity on the site. » Watercourses and drainage areas: this represents a number of ecological processes including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal; 	<ul style="list-style-type: none"> » Erosion control measures (as contained in the EMP) will have to be implemented during the construction of the PV facility and erosion to be monitored during the operational life of the facility. » Areas of high ecological sensitivity require mitigation measures during construction to avoid negative impacts on ecology, and to be contained in the EMP.
<ul style="list-style-type: none"> » Protected species such as <i>Ornithogalum</i> spp. in the family Hyacinthaceae; <i>Ruschia intricata</i>, <i>Chasmatophyllum maninum</i> and <i>Trichodiadema</i> cf. <i>barbatum</i> of the family Aizoaceae/ Mesembryanthemaceae, all species of the family Crassulaceae, Iridaceae and Asphodelaceae occur on the site. The only CITES listed species found on the site was <i>Aloe broomii</i> var. <i>broomii</i>, which is listed as an Appendix II species and also as TOPS species. 	<ul style="list-style-type: none"> » In terms of the Northern Cape Nature Conservation Act (Act No. 9 of 2009) a permit is required for these species for removal of these species before construction can commence. With suitable mitigation, such as minimising the destruction of vegetation and re-vegetating bare areas as soon as possible, and/or transplanting plants wherever feasible, impacts on the vegetation on site and the wider ecosystem can be minimised as well. Without mitigation, degradation of the site as a result of the development will be inevitable. The CITES (the Convention on International Trade in Endangered Species). Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation

SENSITIVE FEATURE	IMPLICATIONS FOR PROJECT IMPLEMENTATION TO BE INCLUDED IN EA
	incompatible with their survival and TOPS is the threatened and protected species list of the National Environmental Management: Biodiversity Act.

The construction of the proposed Amandla Welanga Solar Energy Facility should be implemented according to this EMP to adequately mitigate and manage potential impacts associated with construction activities. The construction activities and relevant rehabilitation of disturbed areas should be monitored against the approved EMP, the Environmental Authorisation and all other relevant environmental legislation.

The EMP has been developed based on the findings of the Basic Assessment, and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

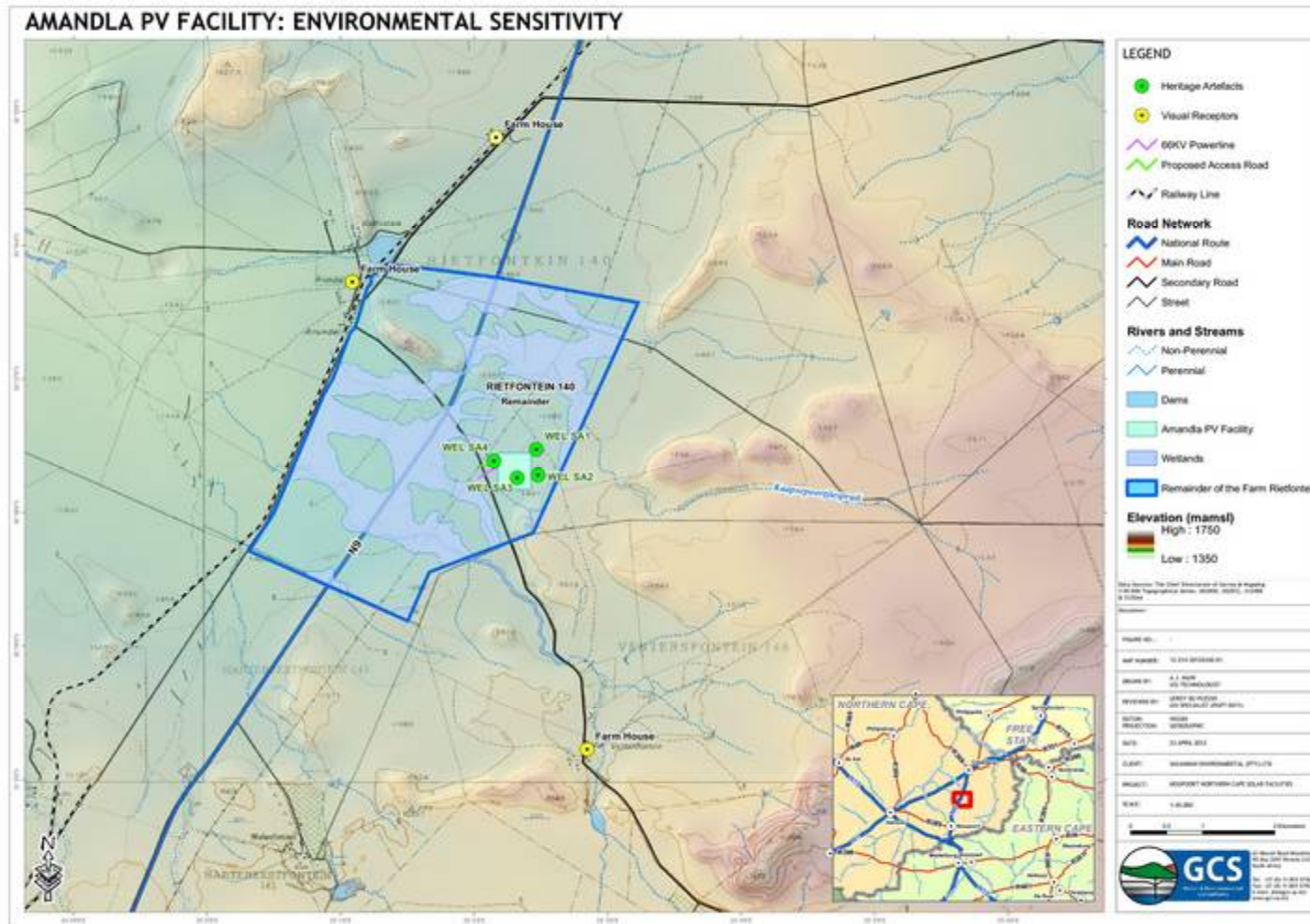


Figure 3: Environmental Sensitivity Map of the Amandla Welanga Solar Energy Facility

STRUCTURE OF THIS EMP

CHAPTER 3

The first two chapters provide background to the EMP and the proposed project, while the chapters which follow consider the following:

- » Key legislation applicable to the development;
- » Planning and design activities;
- » Construction activities;
- » Operation activities; and
- » Decommissioning activities.

These chapters set out the procedures necessary for the developer, as the project developer, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMP has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMP table has been established for each environmental objective. The information provided within the EMP table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures?	Periods for implementation.

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMP.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and EMP tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- » Planned activities change (i.e. in terms of the components and/or layout of the facility);
- » Modification to or addition to environmental objectives and targets;
- » Relevant legal or other requirements are changed or introduced; and
- » Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

3.1. Project Team

This draft EMP was compiled by:

	Name	Company
EMP Compilers:	Marinus Boon- Environmental Assessment Practitioner (EAP) Ravisha Ajodhapersadh- Environmental Assessment Practitioner (EAP) Karen Jodas – EAP	Savannah Environmental
Specialists:	Ecotrust cc – fauna, flora and ecology	Ecotrust cc
	Louis du Pisani – geology, soils and erosion potential	Eduplan
	Celeste Booth – heritage	Albany Museum
	GCS – Visual & Mapping	GCS

The Savannah Environmental team have extensive knowledge and experience in EIAs, Basic Assessments and environmental management, having been involved in Environmental Impact Assessment and Basic Assessment processes over the past ten years. They have managed and drafted EMPs for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

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

- » National Environmental Management Act (Act No 107 of 1998).
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010).
- » Guidelines published in terms of the NEMA EIA Regulations, in particular:
 - * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
 - * Public Participation in the EIA Process (DEA, 2010).
 - * Integrated Environmental Management Information Series (published by DEA)
- » International guidelines – the Equator Principles

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the Basic Assessment Report. A review of legislative requirements applicable to the proposed project is provided in the table that follows.

Table 4.1: Relevant legislative and permitting requirements applicable to the establishment of the proposed PV Plant

Title of legislation, policy or guideline:	Administering authority:	Date:
National Environmental Management Act (Act No. 107 of 1998)	<ul style="list-style-type: none"> » National Department of Environmental Affairs » Northern Cape Department of Economic Development, Environment, and Tourism 	1998
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	<ul style="list-style-type: none"> » National Department of Environmental Affairs 	2004
National Environmental Management: Waste Act (Act No. 59 of 2008)	<ul style="list-style-type: none"> » National Department of Water Affairs » Northern Cape Department of Environment and Nature Conservation 	2008

National Water Act (Act No. 36 of 1998)	<ul style="list-style-type: none"> » National Department of Water Affairs » Northern Cape Department of Water Affairs 	1998
Environment Conservation Act (Act No. 73 of 1989)	<ul style="list-style-type: none"> » National Department of Environmental Affairs » Northern Cape Department of Environment and Nature Conservation » Local Authority 	1989
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	<ul style="list-style-type: none"> » Department of Minerals and Energy 	2002
National Heritage Resources Act (Act No. 25 of 1999)	<ul style="list-style-type: none"> » South African Heritage Resources Agency 	1999
National Forests Act (Act No. 84 of 1998)	<ul style="list-style-type: none"> » Department of Forestry 	1998
National Veld and Forest Fire Act (Act 101 of 1998)	<ul style="list-style-type: none"> » Department of Forestry 	1998
Government Notice No. 1477 of 2009: Draft National List of Threatened Ecosystems	<ul style="list-style-type: none"> » Provincial Department of Environmental Affairs 	2009
Subdivision of Agricultural Land Act (Act No. 70 of 1970)	<ul style="list-style-type: none"> » Department of Agriculture 	1970
Hazardous Substances Act (Act No. 15 of 1973)	<ul style="list-style-type: none"> » Department of Health 	1973
National Road Traffic Act (Act No 93 of 1996)	<ul style="list-style-type: none"> » South African National Roads Agency Limited (national roads) » Provincial Department of Transport 	1996
Development Facilitation Act (Act No 67 of 1995)	<ul style="list-style-type: none"> » Local and District Municipality 	1995
Promotion of Access to Information Act (Act No. 2 of 2000)	<ul style="list-style-type: none"> » National Department of Environmental Affairs 	2000
Promotion of Administrative Justice Act (Act No. 3 of 2000)	<ul style="list-style-type: none"> » National Department of Environmental Affairs 	2000
Guideline Documents		
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	<ul style="list-style-type: none"> » Provincial Department of Transport 	
Provincial Planning		
Land Use Planning Ordinance 15 of 1985	<ul style="list-style-type: none"> » Details land subdivision and rezoning requirements and procedures 	1985
Policies and White Papers		

The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» N/A	1998
The White Paper on Renewable Energy (November 2003)	» N/A	2003
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» N/A	N/A
Miscellaneous		
Pixley Ka Seme District Municipality	» IDP	2009 - 2012

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

Overall Goal: undertake the planning and design phase in a way that:

- » Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- » Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the linear components, including the access roads and power line alignments.
- » Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

5.1 Objectives

OBJECTIVE: Ensure the facility design responds to identified environmental constraints and opportunities

In order to minimise impacts associated with the construction and operation of the facility, the following surveys are required to be undertaken during the final design phase:

- » Geotechnical survey – this will investigate flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be constructed, and the extent of earthworks and compaction required in the establishment of any internal access roads.
- » A storm-water management plan – this will detail how storm-water runoff (i.e. over engineered hard surfaces) can be managed to reduce velocities and volumes of water that could lead to erosion.

Project Component/s	<ul style="list-style-type: none">» PV Panels.» Access roads (i.e. temporary single lane access tracks)» 66kV overhead powerline» Underground cabling.» Associated buildings (i.e. workshop).
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Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all the facilities components.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The design of the facility responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Undertake a geotechnical pre-construction survey.	Geotechnical specialist	Design
Obtain any additional environmental permits required (i.e. permit to remove protected tree species and/ water use licence).	The developer	Project planning
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and relevant appendices.	Contractor and The developer	Design review
External access point and internal access road to be carefully planned to maximise road user safety.	The developer and Contractor	Design
Compile a comprehensive storm water management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of stormwater within the site (i.e. separate clean and dirty water streams, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. during thunder showers).	The developer	Design

Performance Indicator	<ul style="list-style-type: none"> » The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the Basic Assessment Report.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: Ensure the selection of the best environmental option for the alignment of the, overhead powerline, underground cabling and temporary access roads

66 kV underground cables will be laid between the PV panels, the transformers, the switchgear. This will require the excavation of trenches within which they can then be laid. Temporary access roads will be required during construction in order to access the area within the broader farm portion where the PV panels will be placed. The site is directly accessible off the N9 national road, via farm access roads. However an addition access road of 150m in length will be built from the N9 to the site.

Project Component/s	<ul style="list-style-type: none"> » Underground cabling. » Temporary internal access roads.
Potential Impact	<ul style="list-style-type: none"> » Routes that degrade the environment unnecessarily, particularly with respect to loss of indigenous flora, and erosion.
Activities/Risk Sources	<ul style="list-style-type: none"> » Alignment of underground cabling. » Alignment of new temporary access roads.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Ensure selection of best environmental option for alignment for the linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Select an alignment for the underground cabling and any new temporary access roads that curtails environmental impacts and enhances environmental benefits.	The developer and Contractor	Prior to submission of the final construction layout plan
Consider design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and relevant appendices.	Contractor	Design

Performance Indicator	<ul style="list-style-type: none"> » Underground cabling and new temporary access road alignments meet environmental objectives. » Selected linear alignments that minimise any negative environmental impacts and maximise any benefits.
Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and

mitigation measures in the Basic Assessment Report through review of the design by the Project Manager, and the ECO prior to the commencement of construction.

OBJECTIVE: Minimise stormwater runoff

Project Component/s	» Stormwater management components. » Any hard engineered surfaces (i.e. new access roads).
Potential Impact	» Poor stormwater management.
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of stormwater to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Develop an appropriate storm water management plan for implementation during construction and operation. This plan must ensure the suitable handling of stormwater within the site (i.e. clean and dirty water streams around the PV facility).	The developer and Contractor	Planning and design
Appropriately plan hard-engineered bank erosion protection structures.	The developer and Contractor	Planning and design

Performance Indicator	» Sound water quality and quantity management. » Appropriate storm water management plan developed for implementation prior to commencement of construction
Monitoring	» None required.

MANAGEMENT PROGRAMME: CONSTRUCTION

CHAPTER 6

Overall Goal: Undertake the construction phase in a way that:

- » Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- » Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- » Minimises the impact on the indigenous natural vegetation, protected tree species.
- » Minimises impacts on fauna using the site.
- » Minimises the impact on heritage site should they be uncovered.
- » Establishes an environmental baseline during construction activities on the site, where possible.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, The developer must ensure that the implementation of the facility complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation. The developer will retain various key roles and responsibilities during the construction of the facility.

OBJECTIVE: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMP

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below.

Project Manager will:

- » Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that the developer and its Contractor(s) are made aware of all stipulations within the EMP.
- » Ensure that the EMP is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully conversant with the Basic Assessment Report for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

Site Manager (The developer's on-site representative) will:

- » Be fully knowledgeable with the contents of the Basic Assessment Report.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the EMP.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMP and its implementation.
- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- » Confine activities to the demarcated construction site.

Environmental Control Officer (ECO) will:

- » Be responsible for monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification.
- » Be fully knowledgeable with the contents with the Basic Assessment Report.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the EMP.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.

- » Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMP.
- » Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.

Contractors and Service Providers: It is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » A copy of the EMP must be easily accessible to all on-site staff members.
- » Employees must be familiar with the requirements of this EMP and the environmental specifications as they apply to the construction of the proposed facility.
- » Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Staff will be informed of environmental issues as deemed necessary by the ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- » Ensuring adherence to the environmental management specifications.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken.
- » Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMP.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

6.2 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE: Minimise impacts related to inappropriate site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. PV panels, transformers, switchgear and ancillary buildings). » Linear infrastructure (i.e. underground cabling and new access roads).
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species and protected tree species.
Activities/Risk Sources	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor and Security Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	Contractor and Security Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor and Security Contractor	Site establishment
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All development footprints should be appropriately fenced off and clearly demarcated.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Site establishment, and duration of construction
Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction

Performance Indicator	<ul style="list-style-type: none"> » Site is secure with no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site.
Monitoring	<ul style="list-style-type: none"> » An incident reporting system must be used to record non-conformances to the EMP. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE: Appropriate management of the construction site and construction workers

Approximately 60-80 people are expected to be required during the construction phase which is expected to take place over a period of 9 months. Of these 60-80 people, 25% is estimated to be low skilled/semi-skilled positions, and 75% skilled. Low/semi-skilled positions will ideally be filled by locals living in and around Noupoort and potentially from places further afield such as Middleburg and Colesberg. Workers not living in the area, including those for skilled positions, will not be housed on site.

Project Component/s	<ul style="list-style-type: none"> » Area and linear infrastructure.
Potential Impact	<ul style="list-style-type: none"> » Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	<ul style="list-style-type: none"> » Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified by the Basic Assessment studies. The location of this construction equipment camp/s must be approved by the project ECO.	Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure ablution facilities are appropriately maintained.	Contractor	Site establishment, and duration of construction
Ensure waste removal facilities are appropriately maintained and emptied as and when required.	Contractor	Site establishment, and duration of construction
The terms of this EMP and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts	The developer	Tender process
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp	Contractor and sub-contractor/s	Duration of contract
Cooking/meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food	Contractor and sub-contractor/s	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
waste.		
No one other than the ECO or personnel authorised by the ECO may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s	Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction

Performance Indicator	<ul style="list-style-type: none"> » The construction camps have avoided sensitive areas, as approved by the ECO. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported by the ECO. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	<ul style="list-style-type: none"> » Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate waste water treatment works. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase

Approximately 60-80 people are expected to be required during the construction phase which is expected to take place over a period of 9 months) of which 25% is estimated to be low skilled/semi-skilled positions, and 75% skilled.

Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction activities associated with the establishment of the PV facility.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business.
Activities/Risk Sources	<ul style="list-style-type: none"> » Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » The inflow of various specialists from outside the study area and even abroad. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
Mitigation: Target/Objective	» Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.

Mitigation: Action/Control	Responsibility	Timeframe
Employment of local community members (i.e. source labour from within the municipal area focused on the communities in closest proximity to the site) should be undertaken where possible.	The developer, Local Municipality, Contractor	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and developer in identifying people whose skills may correspond with the required job specifications.	The developer, Local Municipality, Contractor	Pre-construction
An equitable process should be promoted whereby locals and previously disadvantaged individuals (including women) are considered for employment opportunities.	The developer, and Local Municipality	Duration of construction
Create conditions that are conducive for the	The developer,	Pre-

Mitigation: Action/Control	Responsibility	Timeframe
involvement of entrepreneurs, small businesses, and SMMEs during the construction process.	Local Municipality, Contractor	construction
Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	The developer, Contractor	Pre-construction
A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour.	The developer, and Contractor	Pre-construction
Skills training and capacity building should be embarked upon from the onset of the construction phase and even prior to the construction phase if possible.	The developer, and Contractor	Pre-construction and construction
Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations.	The developer	Pre-construction and construction

Performance Indicator	<ul style="list-style-type: none"> » Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » SMMEs are awarded contracts, where possible, during the construction phase. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities regarding unrealistic employment opportunities or that only outsiders were employed.
Monitoring	<ul style="list-style-type: none"> » Developer and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Maximise capacity building and skills training, and address economic inequities within the study area

As the construction phase would involve unskilled, semi-skilled, and skilled workers, it is likely that locals could be sourced for the unskilled and semi-skilled positions. Due to the high unemployment figures in the study area, it is clear

that there would be various unemployed persons in search of employment, even if they can only secure temporary positions. For the lower level skilled positions, outsiders would thus definitely not have to be externally sourced. Even though all that would be employed might not have the necessary applicable skills, this issue could be addressed through proper focussed skills training and capacity building initiatives after locals have been sourced, but prior to construction activities starting.

Project Component/s	» Availability of required skills in the local communities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business could be maximised.
Activities/Risk Sources	» Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Higher skilled positions might be sourced internationally.
Mitigation: Target/Objective	» Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building

Mitigation: Action/Control	Responsibility	Timeframe
The developer, in discussions with the local municipality, should aim to employ a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible.	The developer, Contractor, and Local Municipality	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations in identifying people whose skills may correspond with the job specifications.	v, Contractor, and Local Municipality	Pre-construction
In cases for the semi-skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	The developer, Contractor, and Local Municipality	Duration of construction
A proactive consultative skills-audit should be undertaken in the local communities where job creation is currently a significant need.	The developer, and Local Municipality	Pre-construction, and construction
Appropriate training should be provided as per a skills development plan to narrow the gap between skills and demand. It is preferable that training be of such a nature that the skills thereby acquired are transferable and of real benefit in other employment contexts.	The developer, and Local Municipality	Pre-construction, and construction

Performance Indicator	» A skills development plan is developed. » Job opportunities, especially of lower skilled positions, are
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	<p>primarily awarded to members of local communities.</p> <ul style="list-style-type: none"> » Skills training and capacity building initiatives are developed and implemented. » Local SMMEs and/or entrepreneurs awarded the opportunity to become involved in the tender process.
Monitoring	<ul style="list-style-type: none"> » Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Minimise the impact of the inflow of an outside workforce and job seekers into the study area

The inflow of jobseekers to the proposed site would be the greatest during the peak construction period of the PV facility, but also when the construction activities of the other large construction projects are becoming less intensive. Other possible negative impacts due to the workforce's presence in the area and especially when jobseekers come to the area would include misconduct of workers, trespassing of workers on privately owned farms, the possible increase in crime, littering, increase in traffic, increase in noise, the development of informal vending stations, and poaching of livestock.

Project Component/s	<ul style="list-style-type: none"> » Inflow of an outside workforce and jobseekers.
Potential Impact	<ul style="list-style-type: none"> » The inflow of outsiders and jobseekers could result in negative impacts on the surrounding property owners and local communities, and could even lead to conflict between the locals and these outsiders.
Activities/Risk Sources	<ul style="list-style-type: none"> » Outside workforce and jobseekers come into conflict with locals, their presence leads to environmental pollution and possibility of them remaining in the area (without proper housing facilities) after construction has ceased. This would put additional pressure on the existing infrastructure and services. » Locals are not employed, which would increase the probability of the impacts of conflict occurring.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » A limited number of outsiders employed. » Pro-active measures in place to deal with possible jobseekers.

Mitigation: Action/Control	Responsibility	Timeframe
Implement a transparent approach and open consultation with adjacent property owners, prior and throughout the construction period in order to provide a platform where grievances or requests can be	Contractor	Pre-construction, construction

Mitigation: Action/Control	Responsibility	Timeframe
addressed before issues become contentious.		
Construction workers falling within the semi-skilled to unskilled category should be sourced from the local population where possible.	Contractor	Construction
Local labourers should remain at their existing residences.	Contractor	Construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), should be informed of the details of the contractors, size of the workforce and construction schedules.	The developer	Pre-construction, construction
On-site security should be active prior to the construction phase.	The developer	Pre-construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction
Sufficient water and sanitation facilities should be provided for the workers on site during the construction phase.	Contractor	Construction
The construction site should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	Contractor	Construction
The construction site should be appropriately fenced.	Contractor	Pre-construction
The applicant, local leaders, and the Local Municipality should jointly develop a strategy to minimise the influx of jobseekers to the area.	The developer, local leaders and Local Municipality	Pre-construction, construction
Informal vending stations should not be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station.	Contractor	Construction
Information distributed as part of the existing HIV/Aids awareness campaigns in the area should again be focused on and communicated to the local workforce.	The developer, and Contractor	Construction
Develop a transparent communication and recruitment process to minimise the influx of jobseekers to the area.	The developer, and Contractor	Pre-construction
The recruitment process and the use of contractors should be clearly communicated to the local communities.	The developer	Pre-construction
The communication strategy should ensure that unrealistic employment expectations are not created.	The developer, and Contractor	Pre-construction,

Mitigation: Action/Control	Responsibility	Timeframe
		construction
Performance Indicator	<ul style="list-style-type: none"> » Locals are employed where possible. » Reports are not made from members of the local communities regarding unrealistic employment opportunities and/or negative intrusions or even possible increase in crime. » Sound environmental management of the construction site. » No conflict between outsiders, jobseekers, and local community members. 	
Monitoring	<ul style="list-style-type: none"> » KSE and or appointed ECO must monitor indicators listed above to ensure that they have been implemented. 	

OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site

The components will be transported to site (in sections and components). The following civil engineering construction equipment will be required on site (e.g. excavators, trucks, ready mix cement trucks, etc.) as well as components required for the establishment of the switchgear.

The impact of the heavy vehicles associated with the proposed PV facility could add to some of the pressure on the road capacity and road surface, although to a limited extent. The increase in heavy vehicle traffic during the construction phase is not anticipated to significantly impact on the daily living and movement patterns of residents in Noupoort when these vehicles move through town as the movement associated with this project would be of a limited and intermittent extent.

Project Component/s	<ul style="list-style-type: none"> » Delivery of any component required within the construction phase.
Potential Impact	<ul style="list-style-type: none"> » Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks.

	<ul style="list-style-type: none"> » Foundations or plant equipment installation. » Transportation of ready-mix concrete to the site. » Mobile construction equipment movement on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise impact of traffic associated with the construction of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions

Mitigation: Action/Control	Responsibility	Timeframe
The contractor's transportation and construction plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the commencement of construction activities on site.	The developer and ECO	Pre-construction
Gravel roads should be sprayed with water to limit dust creation if economically feasible and reasonable from an environmental perspective (water scarce area), or an appropriate dust suppressant should be used.	Contractor and ECO	Construction
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.	The developer and ECO	Planning and design
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	The developer, Contractor and ECO	Construction
A designated access to the proposed site must be used to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep any new hard road surfaces as narrow as possible.	Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	<ul style="list-style-type: none"> » Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Minimise the potential impact on health, safety and security

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities.

The safety of construction workers is also of concern. Further health and safety issues associated with the actual construction site include unauthorised entry to the site and construction areas, the usage of large equipment on site, the risks associated with the storage of equipment and material on site, as well as the increased risk of accidents due to the increased movement of construction vehicles on the local roads.

Other concerns relate to littering, unwanted behaviour of construction workers, transmission of Sexually Transmitted Diseases (STDs), environmental pollution, an increase risk in fires and so forth. Although such perceptions cannot be substantiated or be changed it should be sensitively dealt with. It is thus clear that even though the construction phase when these impacts could occur is only of a limited duration, the effects of the impacts could remain in the medium term.

Project Component/s	» Inflow of workers could result in increased safety and security risks.
Potential Impact	» Outside workers are involved in criminal activities and/or fires occur.
Activities/Risk Sources	<ul style="list-style-type: none"> » Safety of individuals and animals are at risk. » Theft of livestock. » Theft of construction material. » On-site accidents. » Spread of sexually transmitted diseases. » Littering and environmental pollution.
Mitigation: Target/Objective	» Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

Mitigation: Action/Control	Responsibility	Timeframe
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	Contractor	Pre-construction
Screening of applicants could lessen perceived negative perceptions about the outside workforce.	Contractor	Pre-construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule, and movement of workers.	The developer	Construction
Care should be taken to avoid conflict between the local communities and the "outside" workforce	The developer and Contractor	Pre-construction and construction
Property owners, their workers, as well as local communities should be motivated to be involved in crime prevention and by reporting crimes.	The developer, and Local communities	All phases of project
The construction site should be fenced and access to the area controlled.	The developer and Contractor	All phases of project
Security personnel should be aware of the possibility of animal theft and poaching and should be able to	The developer , Contractor and	Construction

Mitigation: Action/Control	Responsibility	Timeframe
identify possible criminal elements and/or criminal activities in this regard.	Security Contractor	
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners and the local municipality	The developer, Contractor, Local Municipality, and local communities	Pre-construction and when required
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Appropriate fire-fighting equipment must be present on site and members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No criminal activities and theft of livestock are reported. » No fires or on-site accidents occur.
Monitoring	<ul style="list-style-type: none"> » The developer and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Minimise the potential impact on the daily living and movement patterns

Changes or disruptions in the daily living and working activities of residents is most likely to occur during the construction phase and are likely to include the following:

- » *Noise and dust pollution* - During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the site as well as main and internal access roads. Residents in close proximity to the site, such as those residing in Noupoort would thus be mostly negatively affected by these nuisance factors. The intensity of the negative impacts, would, however depend on the wind direction and timing of construction activities.
- » *Transportation routes* - The number of vehicular traffic resulting from the proposed project.

Project Component/s	<ul style="list-style-type: none"> » Construction activities associated with the area and linear infrastructure.
Potential Impact	<ul style="list-style-type: none"> » Noise and general intrusion. » Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and construction equipment
Activities/Risk Sources	<ul style="list-style-type: none"> » Increased risk of accidents due to increase in vehicle movement. » Possible degradation of local roads. » Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Limit negative impacts on the farming activities and on the surrounding property owners' daily living and movement patterns. » Ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase » Minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance from dust emissions from road or vehicle sources are not visibly excessive.	Contractor	Site establishment and construction
Source general construction material and goods locally where available to limit transportation over long distances.	The developer and Contractor	Pre-construction and construction
Construction activities should not interfere with the agricultural activities on surrounding properties.	The developer, Contractor, and affected property owner	Pre-construction
Ensure that any damage to roads due to construction activities is repaired before completion of the construction phase.	Contractor	Site establishment and

Mitigation: Action/Control	Responsibility	Timeframe
		construction
An appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins if required by the wind conditions.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the ECO.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction in an area is completed.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
As far as possible, working hours should be kept to normal working hours (e.g. 7 am until 5 pm) during the construction and operational phases. Where work is required to extend beyond this timeframe, surrounding landowners must be timeously notified.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No impacts on surrounding agricultural land. » Limited noise and dust pollution. » Limited intrusions on surrounding property owners. » No reports from property owners regarding problems with construction activities (i.e. dust or noise) and workforce. » Limited degradation of local roads. » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis
Monitoring	<ul style="list-style-type: none"> » Developer, and appointed ECO must monitor indicators listed above to ensure that they have been implemented. » Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:

	<ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints must be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.
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OBJECTIVE: Minimisation of development footprint / disturbance to topsoil

In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.

Project Component/s	<ul style="list-style-type: none"> » PV Panels. » Underground cabling. » Ancillary buildings. » Temporary access roads » Overhead powerlines.
Potential Impact	<ul style="list-style-type: none"> » Impacts on indigenous vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Excavation activities. » Construction of site access road. » Construction of underground cabling. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats. » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to	Contractor	Site

Mitigation: Action/Control	Responsibility	Timeframe
demarcated areas so that impact on flora and fauna is restricted.		establishment & duration of contract
All fill material must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months.	Contractor	Site establishment & duration of contract
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
The maximum topsoil stockpile height must not exceed 2 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

- » Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere.
- » Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion.
- » Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged.

Project Component/s	<ul style="list-style-type: none"> » PV Panels. » Underground cabling. » Ancillary buildings. » Temporary access roads » Overhead power lines.
Potential Impact	<ul style="list-style-type: none"> » Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	<ul style="list-style-type: none"> » Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise extent of disturbance areas. » Minimise activity within disturbance areas. » Minimise soil degradation (mixing, wetting, compaction, etc). » Minimise soil erosion. » Minimise instability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Identify disturbance areas and restrict construction activity to these areas.	Contractor	Before and during construction
Rehabilitate disturbance areas as soon as practicable when construction in an area is complete.	Contractor	During and after construction
Any new temporary access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	Engineer, ECO, and Contractor	Design and construction
Appropriate dust control must be implemented on construction site (i.e. wetting of denuded areas).	Contractor	Construction
Soil conservation: Stockpile topsoil for re-use in rehabilitation phase, protect stockpile from erosion.	Contractor	Before and during construction
Implement appropriate erosion control measures where required on site (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, shade nets, or temporary mulching over denuded area as required).	Contractor, and ECO	Erection: Before construction Maintenance: Duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	Engineer, ECO, and, Contractor	Before construction

Mitigation: Action/Control	Responsibility	Timeframe
		and Maintenance Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » No activity outside demarcated disturbance areas. » Acceptable level of activity within disturbance areas, as determined by the ECO. » Acceptable level of soil erosion around site, as determined by the ECO. » Acceptable state of excavations, as determined by the ECO. » No activity in restricted areas.
Monitoring	<ul style="list-style-type: none"> » Monthly inspections of the site by the ECO. » Monthly inspections of sediment control devices. » Immediate reporting of ineffective sediment control systems. » An incident reporting system will record non-conformances.

OBJECTIVE: Minimise the impacts on and loss of indigenous vegetation

The loss of indigenous natural vegetation may lead to:

- » Negative change in the conservation status of habitat (Driver et al. 2005);
- » Increased vulnerability of remaining portions to future disturbance;
- » General loss of habitat for sensitive species;
- » Loss in variation within sensitive habitats;
- » General reduction in biodiversity;
- » Increased fragmentation (depending on location of impact); and
- » Disturbance to processes maintaining biodiversity and ecosystem goods and services; and loss of ecosystem goods and services.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	<ul style="list-style-type: none"> » Vegetation clearing. » Construction of access roads. » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation:	» Minimise footprints of disturbance of vegetation/habitats.

Target/Objective	<ul style="list-style-type: none"> » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.
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Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
A site rehabilitation programme must be developed and implemented (refer Chapter 7).	Contractor in consultation with an ecological specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Prevent damage to drainage and wetland areas

In order to prevent damage to the wetland the development footprint should be planned carefully and the detailed design to avoid impacts on the wetlands which occur on the site.

Project Component/s	<ul style="list-style-type: none"> » Any activity that could result in a disturbance or loss of the wetlands, natural vegetation and change soil properties e.g construction of solar facility infrastructure, access roads, power lines.
Potential Impact	<ul style="list-style-type: none"> » Disturbance or loss of drainage areas during the construction and operational phase results in a loss of biodiversity and habitat; increases declared weed and alien invasive plant species; increases soil erosion; and disrupts natural faunal populations.

Activities/Risk Sources	» Construction and operational phases.
Mitigation: Target/Objective	» No damage to wetlands and drainage lines.

Mitigation: Action/Control	Responsibility	Timeframe
Development should be contained within the proposed footprint of the solar facility and unnecessary disturbance adjacent to the site should be avoided.	Contractor	Construction
The denuded and disturbed site should be re-vegetated as soon as possible.	Contractor	Construction

Performance Indicator	The continued presence of wetland related habitat within the development area and the absence of surface impacts within these parts. The current biodiversity status will be used as a benchmark for future reference
Monitoring	Implement a monitoring programme of which the aims and objectives should be to monitor: <ul style="list-style-type: none"> » Compliance to the approved EMP; » Status of invasive species on site; » Status of impacts within sensitive areas; » Seasonal biodiversity (species richness) surveys;

OBJECTIVE: Minimise the establishment and spread of alien invasive plants

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices (Zachariades et al. 2005). Consequences of this may include:

- » Loss of indigenous vegetation;
- » Change in vegetation structure leading to change in various habitat characteristics;
- » Change in plant species composition;
- » Change in soil chemical properties;
- » Loss of sensitive habitats;
- » Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
- » Fragmentation of sensitive habitats;
- » Change in flammability of vegetation, depending on alien species;
- » Hydrological impacts due to increased transpiration and runoff; and
- » Impairment of wetland function.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/Risk Sources	» Construction, environmental management.
Mitigation: Target/Objective	» There is a target of no alien plants within the project control area during the construction and operation phases.

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction and operation
Establish and implement an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).	Contractor	Construction and operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.
Monitoring	<ul style="list-style-type: none"> » On-going monitoring of area by ECO during construction. » On-going monitoring of area by environmental manager during operation. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Minimise the impacts on fauna

Faunal species are indirectly affected by the overall loss of habitat as direct construction impacts can often be avoided due to the movement of individuals from the path of construction.

With respect to any threatened species, the loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species, unless they are classified as threatened. In the case of threatened animal species, the loss of a population or individual could lead to a direct change in its conservation status. This may arise if the proposed infrastructure is located where it will affect such individuals or populations or the habitat that they depend on. Consequences may include fragmentation of populations of affected species; reduction in area of occupancy of affected species; and loss of genetic variation within affected species.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site.
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment. » Underground cabling and road construction activities.
Mitigation: Target/Objective	» To minimise footprints of habitat destruction. » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing/disturbance.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment and duration of contract
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) must be removed from the affected areas before the start of site clearing/construction and relocated to safe areas.	Specialist	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
A site rehabilitation programme should be developed and implemented.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation and habitats for fauna. » Limited impacts on faunal species (i.e. noted/recorded fatalities).
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » Recording faunal fatalities to monitor success of relocation efforts and an incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Protection of heritage resources

The stone age tools that occurs on the site has been given a rating of Grade III, therefore mitigation / avoidance of the heritage artefact will be required during the construction of the PV facility. The proposed area for development is considered as having a low cultural significance, and the following recommendations must be taken into consideration prior to the construction activities.

Project Component/s	<ul style="list-style-type: none"> » PV Panels. » Transformers and switchgear etc. » Underground cabling. » Ancillary buildings. » Access roads » Overhead powerlines.
Potential Impact	<ul style="list-style-type: none"> » Heritage objects or artefacts found on site are inappropriately managed or destroyed.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Foundations or plant equipment installation. » Mobile construction equipment movement on site. » Underground cabling and access roads construction activities.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
Contractors must be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. All staff should also be familiarised with procedures for dealing with heritage objects/sites.	Contractor, ECO and heritage specialist	Duration of contract, particularly during excavations
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	Contractor in consultation with Specialist	Pre-construction
The ECO must monitor various activities including vegetation clearing and excavation activities to monitor and identify possible archaeological material remains and features that may occur below the surface.	Contractor, and ECO	Pre-construction and duration of contract, particularly during excavations
If concentrations of archaeological or heritage material and/or human remains are uncovered, all work must cease immediately and be reported to the Albany Museum and/or SAHRA so that systematic and professional investigation/excavation can be undertaken.	Contractor and Contractor in consultation with Specialist	If an archaeological resource is discovered
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention.	The developer in consultation with Specialist	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines.
Monitoring	<ul style="list-style-type: none"> » Observation of excavation activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of visual impacts associated with construction

There is the potential for observers in close proximity to the proposed PV facility to be visually affected. There will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and land owners in the area. Dust from construction work could also result in potential visual impact.

Project Component/s	» Construction site and construction accommodation.
Potential Impact	» Visual impact of general construction activities and construction accommodation, and the potential scarring of the landscape due to vegetation clearing.
Activity/Risk Source	» The viewing of the above mentioned by observers near the site.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and construction accommodation and intact vegetation cover outside of immediate works areas.

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the construction period through careful planning and productive implementation of resources.	The developer or contractor	Planning
Plan the placement of lay-down areas and temporary construction accommodation in order to minimise vegetation clearing.	The developer or contractor	Planning
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	The developer or contractor	Construction
Ensure that rubble, litter, and disused construction materials are managed and removed regularly.	The developer or contractor	Construction
Ensure that all infrastructure and the site and general surrounds are maintained in a neat manner.	The developer or contractor	Construction
Reduce and control construction dust using approved dust suppression techniques.	Contractor	Construction
As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate all disturbed areas, construction areas, temporary roads, and servitudes to acceptable visual standards as soon as possible after construction in an area is completed.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Vegetation cover on and near the site is intact with no evidence of degradation or erosion. » Construction site is kept in a neat and tidy state.
Monitoring	<ul style="list-style-type: none"> » Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the PV facility will include general construction waste, hazardous materials (i.e. fuel), and liquid waste (including grey water and sewage)

In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented.

Project Component/s	<ul style="list-style-type: none"> » PV Panels. » Underground cabling. » Ancillary buildings. » Access roads » Overhead powerlines.
Potential Impact	<ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	<ul style="list-style-type: none"> » Packaging. » Other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks, and site preparation.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage from chemical toilets at

- appropriate waste water treatment works.
- » Any permits obtained for other ablutions installed (i.e. French drains) obtained prior to commencement of construction.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be	Contractor	Completion

Mitigation: Action/Control	Responsibility	Timeframe
cleared of potentially polluting materials.		of construction
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Provide a method statement with regard to waste management.	Contractor	Duration of construction

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Appropriate handling and storage of chemicals and hazardous substances

The construction phase may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation:	» To ensure that the storage and handling of chemicals and

Target/Objective	hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.
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Mitigation: Action/Control	Responsibility	Timeframe
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substations must be removed from site by licensed contractors.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately banded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMP.

6.3 Detailing Method Statements

OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMP will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the PV facility, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- » Construction procedures;
- » Materials and equipment to be used;
- » Getting the equipment to and from site;
- » How the equipment/material will be moved while on-site;
- » How and where material will be stored;
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- » Timing and location of activities;
- » Compliance/non-compliance with the Specifications; and
- » Any other information deemed necessary by the Site Manager.

The Contractor may not commence the activity covered by the Method Statement until it has been approved, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

6.4 Awareness and Competence: Construction Phase of the Solar Energy Facility

OBJECTIVE: Ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.

- » Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a PV facility and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended Environmental Awareness Training.
- » The training should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
- » Records must be kept of those that have completed the relevant training.
- » Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
- » Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

6.5 Monitoring Programme: Construction Phase

OBJECTIVE: Monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, The developer will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- » Ensure adequate and appropriate interventions to address non-compliance.
- » Ensure adequate and appropriate interventions to address environmental degradation.
- » Provide a mechanism for the lodging and resolution of public complaints.
- » Ensure appropriate and adequate record keeping related to environmental compliance.
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
- » Aid communication and feedback to authorities and stakeholders.

The ECO will ensure compliance with the EMP, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks.

MANAGEMENT PROGRAMME: REHABILITATION

CHAPTER 7

Overall Goal: Undertake the rehabilitation measures in a way that:

- » Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Area and linear infrastructure.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Temporary construction areas. » Temporary access roads/tracks. » Other disturbed areas/footprints.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction

Mitigation: Action/Control	Responsibility	Timeframe
		activities in an area
The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction camp area and along temporary roads should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
A rehabilitation plan should be drawn up that specifies the rehabilitation process and should be approved by the ECO for implementation.	Contractor, The developer and ECO	Pre-construction
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist as applicable.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	The developer in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas.	The developer in consultation with rehabilitation specialist	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	The developer in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator

- » All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities.

	<ul style="list-style-type: none">» Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas.» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites.» Completed site free of erosion and alien invasive plants.
Monitoring	<ul style="list-style-type: none">» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility.» On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION

CHAPTER 8

Overall Goal: To ensure that the operation of the PV facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Enables the operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
- » Minimises impacts on fauna using the site.
- » Establishes an environmental baseline for solar energy sites in South Africa.

An environmental manager must be appointed during operation whose duty it will be to ensure the implementation of the operational EMP.

8.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation

Indirect impacts on vegetation and terrestrial fauna during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	<ul style="list-style-type: none"> » Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequently rehabilitation at its completion.
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.

Activity/Risk Source	» Movement of employee vehicles within and around site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated access roads.	Contractor	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Contractor	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Contractor	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	The developer and Specialist	Annual monitoring until successful re-establishment of vegetation in an area

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by facility manager and environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE: Minimisation of visual impacts

The visual impact of the facility will have a low significance due to there being few visual receptors in the region.

Project Component/s	<ul style="list-style-type: none"> » PV Panels. » Access roads. » Ancillary infrastructure and buildings » Overhead powerlines.
Potential Impact	» Visual impact due to facility degradation and vegetation

	rehabilitation failure.
Activity/Risk Source	» The proposed facility.
Mitigation: Target/Objective	» To minimise potential for visual impact. » To ensure a well maintained and neat facility.

Mitigation: Action/Control	Responsibility	Timeframe
Maintain the general appearance of the facility in an aesthetically pleasing way.	O&M Contractor	Operation.
Monitor rehabilitated areas, and implement remedial action as and when required.	O&M Contractor	Operation.

Performance Indicator	» Well maintained and neat facility with intact vegetation on and near the facility.
Monitoring	» Monitoring of rehabilitated areas.

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

- » *Soil degradation including erosion* - by wind and water and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
- » *Uncontrolled run-off* - relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems.
- » *Degradation* - of the natural soil profile due to pollution.

Project Component/s	» Underground cabling. » Ancillary buildings. » Access roads.
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting).

	<ul style="list-style-type: none"> » Minimise soil erosion. » Ensure continued stability of embankments/excavations.
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Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	O&M Contractor	Operation
Ensure dust control on site through wetting of denuded areas or the use of an appropriate dust suppression measure.	O&M Contractor	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	O&M Contractor	Operation
Control depth of excavations and stability of cut faces/sidewalls.	Contractor	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager.
Monitoring	<ul style="list-style-type: none"> » Inspections of site on a bi-annual basis. » Water management plan developed and implemented.

OBJECTIVE: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles), and from the augmentation plant. Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	<ul style="list-style-type: none"> » Hard engineered surfaces. » On-site vehicles.
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and the augmentation plant.
Activities/Risk Sources	<ul style="list-style-type: none"> » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	O&M Contractor	Operation
Appropriate dust suppressant must be applied to the roads as required to minimise/control airborne dust.	O&M Contractor	Duration of contract
Speed of vehicles must be restricted, as defined by the ECO.	O&M Contractor	Duration of contract
Vehicles and equipment must be maintained in a road-worthy condition at all times.	O&M Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	<ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Ensure the implementation of an appropriate fire management plan

A fire management plan is required to be in place; of particular importance during the dry season.

Project Component/s	» Operation and maintenance of the PV facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the PV plant infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate fire fighting equipment on site.	EPC Contractor	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Contractor	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Contractor	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Contractor	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Contractor	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » Fire fighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring	<ul style="list-style-type: none"> » KSE must monitor indicators listed above to ensure that they have been met.

OBJECTIVE: Minimise the potential impact on farming activities and on the surrounding landowners

Once operational, the impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (i.e. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site and possible increase in criminal activities). The number of workers on site is anticipated to have minimal negative social impacts in this regard.

Project Component/s	<ul style="list-style-type: none"> » Possible negative impacts of activities undertaken on site on the activities of surrounding property owners. » Impact on farming activities on site.
Potential Impact	<ul style="list-style-type: none"> » Possible limited intrusion impact on surrounding land owners.
Activities/Risk Sources	<ul style="list-style-type: none"> » Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents.
Mitigation:	<ul style="list-style-type: none"> » Effective management of the facility.

Target/Objective	<ul style="list-style-type: none"> » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.
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Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the facility and accommodation facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	O&M Contractor and Security Contractor	Operation
Vehicle movement to and from the site should be minimised as far as possible.	O&M Contractor and Security Contractor	Operation
Limit the development of new access roads on site as far as possible.	O&M Contractor and Security Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » No environmental pollution occurs (i.e. waste, water, and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities in surrounding areas.
Monitoring	<ul style="list-style-type: none"> » Developer should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.

OBJECTIVE: Appropriate handling and management of waste

The operation of the facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, and liquid waste.

Project Component/s	<ul style="list-style-type: none"> » Switchgear. » Transformers.. » Workshop. » Waste generated by Operation and maintenance staff.
Potential Impact	<ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	<ul style="list-style-type: none"> » Transformers and switchgear. » Workshop.

Mitigation: Target/Objective	<ul style="list-style-type: none"> » Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.
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Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, etc.) must be stored in sealed containers within a clearly demarcated designated area.	O&M Contractor	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	O&M Contractor	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	O&M Contractor	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	O&M Contractor	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	O&M Contractor	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Contractor, The developer / waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	O&M Contractor, waste management contractor	Operation
Used oils and chemicals: <ul style="list-style-type: none"> » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority » Waste must be stored and handled according to the relevant legislation and regulations 	O&M Contractor	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	O&M Contractor	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO. » All appropriate waste disposal certificates accompany the monthly reports.

MANAGEMENT PROGRAMME: DECOMMISSIONING

CHAPTER 9

The PV plant is expected to have a lifespan of 25+ years (i.e. with routine maintenance). The power plant infrastructure would only be decommissioned and rehabilitated once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the PV plant considered in this EIA process would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section.

9.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

9.2 Disassemble and Replace Infrastructure

Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

OBJECTIVE: Avoid and or minimise the potential impacts associated with the decommissioning phase

Project Component/s	» Decommissioning phase of the PV plant.
Potential Impact	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life. » Decommissioning is similar to the construction phase in that it will also create temporary employment opportunities.
Activity/Risk Source	» Decommissioning of the PV plant.
Mitigation: Target/Objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV plant.

Mitigation: Action/control	Responsibility	Timeframe
Retrenchments should comply with current South African Labour Legislation.	The developer	Decommissioning

Performance Indicator	Relevant South African Labour Legislation.
Monitoring	No occurrences of dismissals not in-line with South African Labour Legislation.

FINALISATION OF THE EMP

CHAPTER 10

The EMP is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMP be updated to include the final layout submitted prior to construction.