
PROPOSED TUTUKA PV SOLAR ENERGY FACILITY NEAR STANDERTON, MPUMALANGA PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA REFERENCE: 14/12/16/3/3/2/754

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

Accelerated soil erosion: Soil erosion induced by human activities and ultimately leading to irreversible degradation of the ecosystem and loss of ecosystem functionality

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

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.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

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.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

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.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

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 assessment practitioner: An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

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

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

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

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

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

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

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

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

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

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

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

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

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).

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

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of the NEM WA; or any other substance, material or object that is not included in Schedule 3 of the NEM WA that may be defined as a waste by that is identified as waste by the Minister of Environmental Affairs (by notice in the Gazette). Any waste or portion of waste, referred to in the section above, ceases to be a waste:

- (i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
- (ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;
- (iii) where the Minister of Environmental Affairs has, in terms of Section 74 of the NEM WA, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or
- (iv) where the Minister of Environmental Affairs has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste

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INTRODUCTION

CHAPTER 1

Eskom Holding SOC (state owned company) Ltd (hereafter to be referred to as Eskom) is proposing to establish a **photovoltaic (PV)** solar energy facility of up to 65.9 MW and associated infrastructure on a site within the Tutuka Coal Fired Power station boundary, approximately 28 km north-east of Standerton in the Mpumalanga Province (Refer to Figure 1.1). This project is to be known as the Tutuka PV Solar Energy Facility. Based on a pre-feasibility analysis and site identification process undertaken by Eskom a favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA) process.

The EMPr has been developed on the basis of the findings of the EIA, and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all Eskom Holding SOC Ltd employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Tutuka PV Solar Energy Facility. The document must be adhered to, updated as relevant throughout the project life cycle.

PROJECT DETAILS

CHAPTER 2

The Tutuka PV Solar Energy Facility will have a net generating capacity of up to 65.9 MW which will accommodate several arrays of PV panels and associated infrastructure. The project will comprise of the following typical infrastructure:

- » Solar panels (fixed/tracking technology).
- » Mounting structures for the solar panels to be rammed steel piles or piles with pre-manufactured concrete footings, or ground screws to support the PV panels.
- » Central inverter/transformer stations to collect all energy generated from the PV panels. The role of the inverter is to convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- » An on-site substation or switching station.
- » A power line to facilitate the connection of the solar energy facility from the on-site substation to Tutuka power station or nearest grid access point.
- » Internal access roads.
- » Associated buildings including a workshop area for maintenance, storage, and control facility with basic services such as water and electricity.

2.1. Findings of the Environmental Impact Assessment

The area infrastructure will be entirely contained within this identified site and will have a developmental footprint of approximately ~99 ha. In terms of the findings of the EIA Report, various planning, construction, and operation-related environmental impacts were identified, including:

- » Disturbance of the ecological environment (i.e. flora and fauna)
- » Impacts on water resources (i.e. wetlands in the study area)
- » Impacts on the visual aesthetics and sensitive receptors
- » Impacts on the underlying geology (i.e. in terms soil disturbance and erosion)
- » Impacts on soils and agricultural potential
- » Impacts on heritage resources
- » Social impacts

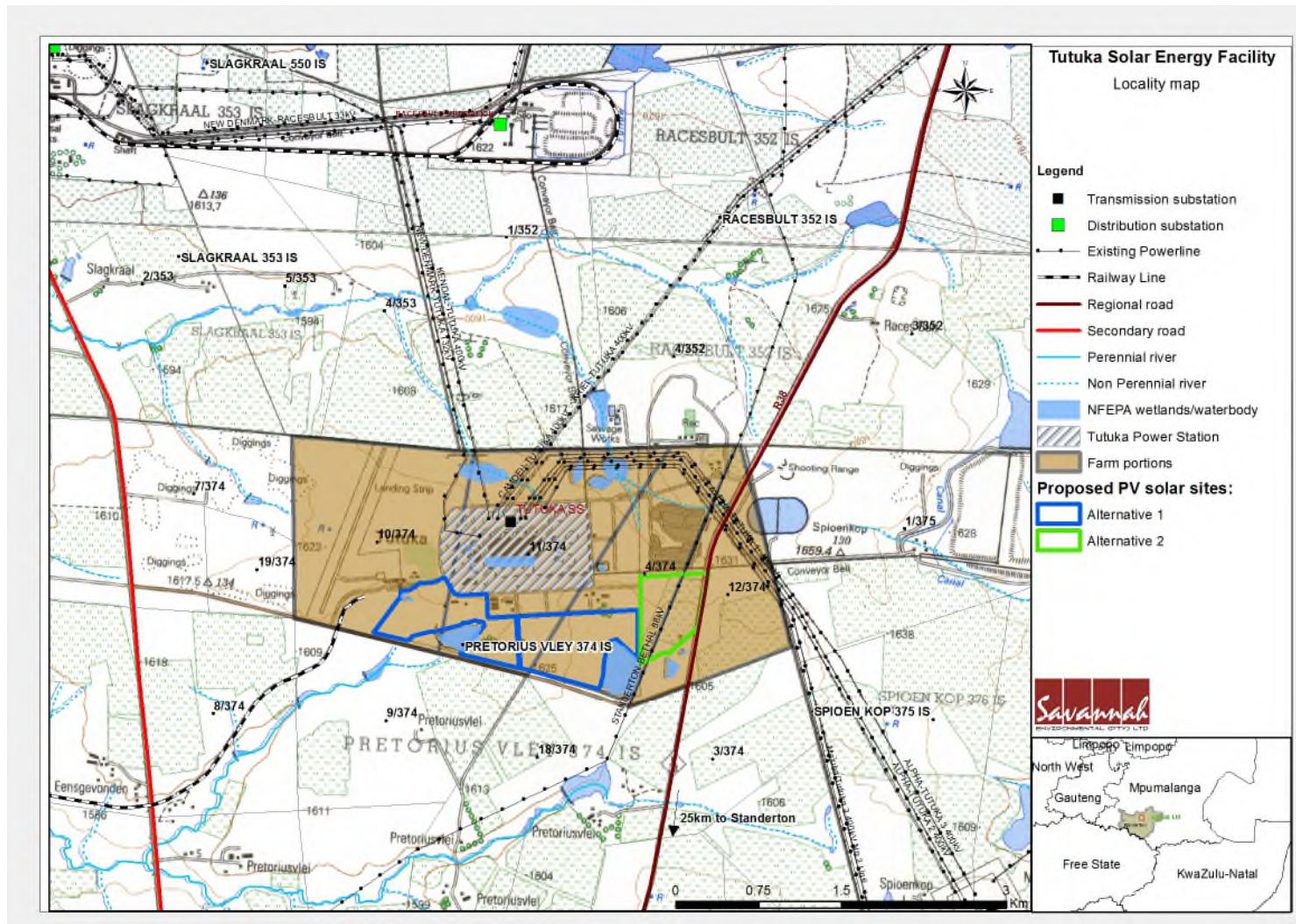


Figure 2.1: Locality map showing the location the proposed Tutuka PV Solar Facility.

In summary, the most significant environmental impacts associated with the proposed project, as identified through the EIA, can be summarised as follows (Refer to Figure 2.2):

Impacts on wetlands

The earth works, construction and operation of the facility will change habitats and the ecological environment, infiltration rates, amount of runoff and runoff intensity of storm-water, and therefore the hydrological regime of the site. Potential impacts to be taken into account include:

- » Loss and disturbance of wetland habitat and fringe vegetation.
- » Introduction and spread of alien invasive vegetation.
- » Changes in the amount of sediment entering the system.
- » Changes in water quality due to toxic contaminants and increased nutrient levels entering the system.
- » Changes in water flow regime due to the alteration of surface characteristics.

Two wetlands were delineated on the study site both being unchannelled valley-bottom wetlands. The two wetlands in the study site are very similar in their function, type and ecology. The wetlands encroach onto the western section of Alternative Site 1 and the southern section of Alternative Site 2. Overall the wetlands on site are largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred. The ecological importance and sensitivity suggests that wetlands in this category are considered to be ecologically important and sensitive on a provincial or local scale.

The overall impact on wetlands is likely to be of a medium significance prior to mitigation. This could be reduced to low negative significance following the implementation of mitigation measures, i.e. avoidance of the wetlands and associated 30 m buffer set to protect wetland functionality. From a wetland function point of view, development should ideally be confined to the central portion of Alternative Site 1, or the northern portion of Alternative Site 2. Alternative Site 1 is considered the most favourable for development of the PV facility since less wetland habitat will be lost.

Impacts on ecology occurring on the site

The selected study area falls within the original extent of the Soweto Highveld Grassland (Unit Gm8). The short to medium high dense tussock grassland is dominated almost entirely by *Themeda triandra*, with a relatively high diversity of grasses, herbs and geophytes (Mucina and Rutherford 2006). None of the grasslands are considered to be in a pristine condition, with only a small section considered to be primary (natural) grassland. The ecological state of the

vegetation on Alternative Site 2 is regarded as Important and Necessary to meet Mpumalanga Biodiversity Targets. This has been confirmed during the field study with a high abundance of some protected plant species, namely *Eulophia ovalis*, *Boophane disticha*, *Gladiolus crassifolius* and *Aloe ecklonis*. From an ecological perspective, it is recommended that Alternative Site 2 be entirely excluded from the proposed development. The eastern sections of Site Alternative 1 are severely degraded and transformed due to past activities is thus more favourable due to minimal ecological impacts.

A total of 973 indigenous plant species have been recorded in the study area according to the SANBI database. Only 120 indigenous species could be confirmed present on site. A large portion of the study site is disturbed or has been transformed in the past, allowing many alien invasives to become established, with 25 alien invasive species recorded.

These grasslands are utilised by Hartebeest and Eland that are being kept within the Tutuka Power Station enclosure. Animals that may be permanently present can be relocated, and may resettle after construction, depending on safety specifications necessitated by the development. No restricted or specific habitat of vertebrates exists on the study area and will be affected by the proposed development; especially if the proposed development remains outside the recommended buffers around wetland and seepage areas. The impact on fauna is expected to be small to negligent.

Other issues identified which could have an impact on the environment include:

- » Impacts on avifauna: The overall impact on Avifauna is likely to be of a medium significance prior to mitigation. This could be reduced to low negative significance following the implementation of mitigation measures, which includes a 30m buffer around the wetlands. Given the presence of existing habitat degradation and disturbance associated with the energy generation and industrial activities that are prevalent in the study area and surrounds, and due to the relatively low importance of the site for many bird species, most impacts are seen as acceptable for avifauna.
- » Impacts on the local soils, land capability and agricultural potential of the site: The overall impact on Soils and Agricultural Potential is likely to be of a medium to low significance prior to mitigation. Most of the area (67%) has low to moderate agricultural potential with the remainder being low to very low. The major impact on the natural resources of the study area would be the loss of arable/grazing land due to the construction of the various types of infrastructure. With the lack of high potential soils in the vicinity, this impact would in all probability have a limited significance.

- » Visual impacts mainly due to the solar panels and partly due to other associated infrastructure (power line, access road etc.). The overall visual impact is likely to be of a low significance. The proposed development will take place within a landscape that is already heavily impacted by large scale industrial development including mining operations and the Tutuka Power Station. The most sensitive landscape areas include the rural landscape surrounding the proposed site, the Thuthukani settlement approximately 5 km west of the proposed site and the Grootdraai dam which is used for recreational purposes is situated approximately 8 km south of the proposed site. The assessment has shown however that both site alternatives will not be visible from the residential area of the Thuthukani settlement and the recreational area of the Grootdraai Dam Areas in the northerly arc between 245° to 110 ° could be affected, which include; landing strip (west of the power station), R38 (east of the Power Station), local road to the New Denmark Colliery (west of power station) and Eskom offices (south of the power station).

- » Impacts on heritage and paleontological resources:
The overall impact on the heritage resources is likely to be of a low significance as very sparse heritage traces (of low heritage value) were found during the field survey. The study area was assessed in terms of the archaeological component of Section 35 of the NHRA and no surface indicators of archaeological (Stone or Iron Age) material was identified in the study area. No burial grounds or graves were recorded and no significant cultural landscapes or viewsapes were noted during the fieldwork. Based on the results of the study it was concluded that there are no significant archaeological risks associated with the proposed solar facility. However graves can be expected anywhere in the landscape and the low archaeological visibility during the survey could result in graves not having been identified in the study area.

- » Social and economic impacts:
The overall social impact is likely to be of a medium significance in terms of positive impacts, and a low medium significance in terms of the negative impacts. The proposed development represents greater positive social potential than negative implications due to the development being located in an industrial area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are identified negative impacts that must be reduced by implementing the mitigation measures recommended. This specifically includes optimising the facility layout to include 30 m buffer zones

around the wetland sensitivities identified in order to avoid impacting on these sensitive habitats. The project must adhere to this constraint to meet the requirements of sustainable development.

2.2. Layout

In response to the identified need to adequately manage impacts within sensitive areas identified on the site development footprint, and in order to demonstrate the ability of the project to adhere to recommended mitigation measures, Eskom has developed a best practice mitigation strategy with regards to the facility layout.

The EIA recommendations have been taken into account by Eskom, and the PV facility layout has been refined to avoid encroachment of wetlands. As recommended in the Wetland assessment the PV facility has been confined to the central portion of Alternative Site 1, in order to maintain optimal wetland functionality. This refinement of the layout has resulted in the repositioning of the PV facility outside of identified sensitive and a decrease in the net generating capacity, from 65.9 MW to 23 MW. This refined layout will still be able to meet the main objective of supplementing Eskom's self consumption at the Tutuka Power station. The required mitigation measures are illustrated in Figure 2.2 and Figure 2.3 represent a positive outcome in terms of impact reduction and mitigation and the optimal layout for the facility.

A optimised layout map has been prepared by Eskom (refer to Figure 2.3) and **Appendix A**). This layout indicates the following:

- » Position of solar facilities and its associated infrastructure;
- » Internal roads indicating width;
- » Connection routes;
- » All existing infrastructure on site;
- » Permanent development footprint;
- » Construction lay down area;
- » Main access road;
- » Substation (indicating entire footprint);
- » Power line connection route; and
- » Buildings and
- » Implementation of the wetland buffer

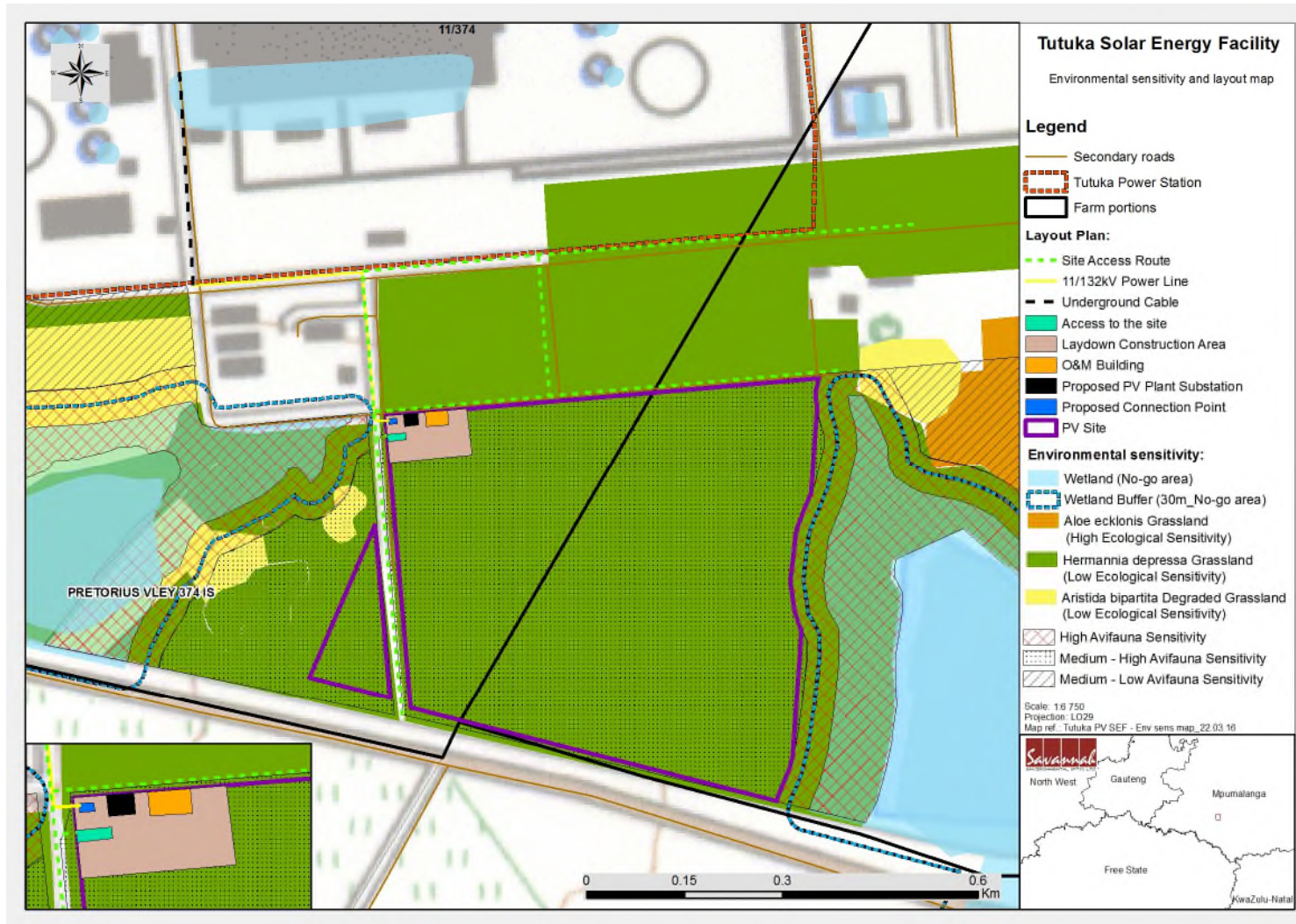


Figure 2.2: The final/optimised layout map superimposed (overlain) on the environmental sensitivity for the Tutuka PV Solar Energy Facility

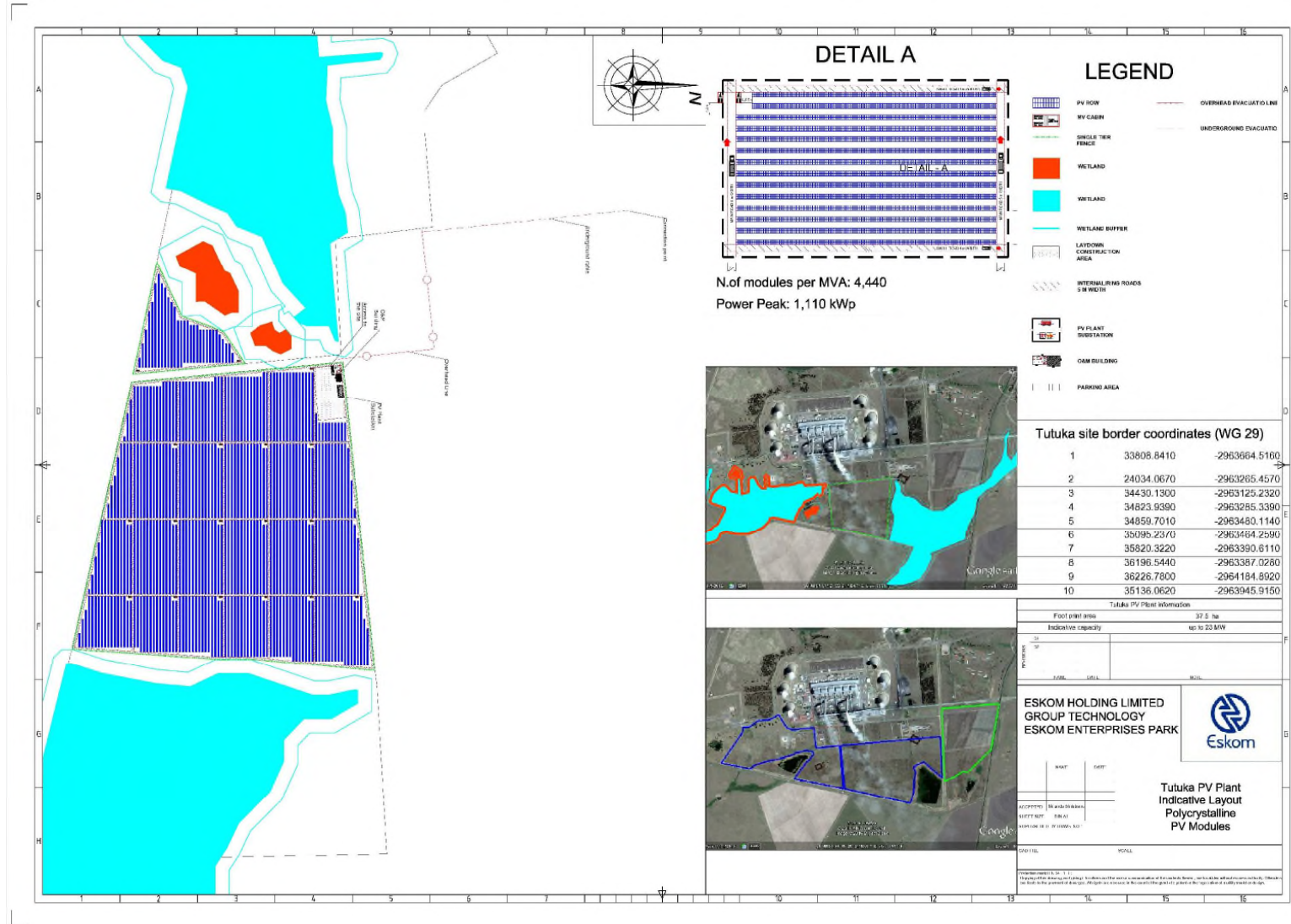


Figure 2.3: The optimised Layout map, including buffers, showing Tutuka PV Solar Energy Facility

2.3 Activities and Components associated with the Solar Energy Facility

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

Construction Phase:

The construction of the proposed project is expected to extend over a period of approximately 15-18 months and create at least ~250-300 employment opportunities at peak. However this number is likely to vary depending on the final designs of the proposed project. In terms of skills requirements, it is common that approximately 45% of the opportunities will be available to low-skilled workers (construction labourers, security staff etc.), 22% will be available to semi-skilled workers (drivers, equipment operators etc.), and 33% will be available to skilled personnel (engineers, land surveyors, project managers etc.). The work associated with the construction phase will be undertaken by contractors and will include the establishment of the Tutuka PV Solar Energy Facility and the associated components, including, access roads, the on-site substation and power line.

The majority of low-skilled employment opportunities associated with the project are likely to benefit members from the local community. In this regard the majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. The majority of the skilled and semi-skilled opportunities are likely to be associated with the contractors appointed to construct the proposed solar energy facility and the associated infrastructure.

Typically the construction will start with ground-works, followed by the erection of mounting structures and the attachment of the solar panels, which will then be integrated to the electrical equipment. The following construction activities are expected to form part of the project's scope of work (refer to **Table 2.1**).

Table 2.1: Activities associated with the construction of a 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> – the geology and topography of the study area will be confirmed. The geotechnical study will look at 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 built 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 solar field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation (once issued) for the facility. » <i>Power line servitude survey</i> – once the placement of the power line towers has been finalised, a walk through survey will be undertaken for ecological sensitivities which may necessitate certain towers to be moved to avoid sensitivities.
Establishment of access roads	<ul style="list-style-type: none"> » Access to the site is provided directly from the R38 that runs east to the boundary of the proposed site and that connects the town of Standerton and Bethal. As material and components would need to be transported access to the site will use existing roads where possible and where there are no existing roads, new roads will be constructed. However, further roads may need to be established for construction and maintenance purposes. The extent of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase of the facility. » Internal roads within the study site may need to be established to provide access during construction and operational phase. These roads will be approximately 6m -8m in width.
Undertake site preparation	<ul style="list-style-type: none"> » Site preparation activities will include clearance of vegetation at the footprint of the area infrastructure (i.e. substation, ancillary buildings) and linear component (i.e. internal access roads). These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. » Site preparation will also include the fencing of the site.
Transport of components and equipment to site	<ul style="list-style-type: none"> » The components for the proposed facility will be transported to site, in sections, by road. Some of the components for the power generation may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)¹ by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, and compaction equipment etc.) as well as components required for the establishment of the substation and power line. » In some instances, the dimensional requirements of the loads to be transported during the construction phase (e.g.

¹ A permit will be required for the transportation of any abnormal loads on public roads.

Activity	Description
	<p>the transformer of the substation) may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) because of abnormal loading.</p>
<p>Establishment of construction camps, workshops, and temporary laydown areas</p>	<ul style="list-style-type: none"> » Once the required construction equipment has been transported to site, dedicated equipment camp(s) and laydown area(s) will be required which will be of a temporary nature and ~2 ha in size. These construction camp(s) will serve to confine activities and storage of equipment to designated area(s) to limit the potential ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. » Fuel required for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction camp(s) to prevent leakages and soil contamination.
<p>Establishment of PV panels</p>	<ul style="list-style-type: none"> » The PV panels will be arranged in arrays, the mounting structure will be preferably fixed onto the ground with the use of rammed or screw anchor foundations. » Trenching would occur within each array to accommodate the electrical cables. The trenches would be up to ~ 1.8m in width and 2m deep, for a total combined length of approximately 10 km. Minimal ground disturbance may occur within the trenched corridors to restore them after soil has been replaced in the trenches, so that the corridor can conform to the existing surface contours.
<p>Establishment of substation and power line</p>	<ul style="list-style-type: none"> » Inverters will be installed to facilitate the connection between the solar energy facility and the Eskom electricity grid via a new 11 kV (for connection at station board) or 132 kV (for connection at HV yard) power line. » The position of the inverters within the footprint will be informed by the final positioning of the PV components. » The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas and protection of erosion sensitive areas.
<p>Undertake site rehabilitation</p>	<ul style="list-style-type: none"> » Once construction is completed and all construction equipment is removed, the areas affected by construction activities must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site that are not required during the operational phase or by the landowner must be closed and prepared for rehabilitation.

Operation and Maintenance Phase:

The operation phase is expected to extend for a period of approximately 20 – 25 years with plant maintenance. It is anticipated that during this time full time security, maintenance, supervision and monitoring teams will be required on site. Maintenance activities will include *inter alia*, replacement and cleaning of the panels (typically using water) and the maintenance of the solar facility components and associated infrastructure (such as access roads). The photovoltaic plant will be operational during daylight hours only. However, it will not be operational under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed.

Table 2.2: Activities associated with the operation of a PV facility

Activity	Description
Operation of the PV panels and the 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 from direct to alternating current. Thereafter the electricity will be conveyed to the substation via the new 11 kV (for connection at station board) or 132 kV (for connection at HV yard) power line. » Occasional cleaning of the panels will be required throughout the life cycle of the facility when necessary.
Site operation and maintenance	<ul style="list-style-type: none"> » Full-time security, maintenance, and control room staff will be required on site. » Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities. » The access to the site and the internal access roads will be maintained during the operational phase. » Vegetation Maintenance and Weed Control measures will be undertaken as required.

Decommissioning Phase

The PV panels and associated infrastructure would only be decommissioned once they have reached the end of their 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 activities will form part of the project scope.

Table 2.3.: Activities associated with the decommissioning of a PV facility

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. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble existing components	The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

2.4. Benefits of the Proposed Project

Internationally there is an increase in the deployment of renewable energy technologies for the generation of electricity due to concerns such as climate change and exploitation of non-renewable resources. Through the Integrated Resource Plan (IRP), the South African Government has set a target for renewable energy of 17 GWh renewable energy contributions to final energy consumption by 2030, to be produced mainly from biomass, wind, solar and small-scale hydro. Eskom has already successfully installed PV systems at offices and parking lots within Eskom-owned property to promote renewable energy awareness and to diversify their own energy mix. Furthermore, Eskom is looking at further reducing its self-consumption at its sites by introducing the PV Programme which aims to install up to 150 MWp at its various power stations, which includes the proposed Tutuka PV Solar Energy Facility. The solar PV facility will promote the reduction of Eskom's carbon footprint and support the demand side management energy efficiency programme.

Through pre-feasibility assessments and research, the technical viability of establishing a 65.9 MW solar energy facility within the Tutuka Coal Fired Power Station in the Standerton area of the Mpumalanga Province has been established by Eskom. The positive implications of establishing a solar energy facility on the demarcated site include:

- » The solar PV facility will promote the reduction of Eskom's carbon footprint and support the demand side management energy efficiency programme;
- » The potential to harness and utilise solar energy resources within the Mpumalanga Province;
- » The project would assist the South African government in reaching their set targets for renewable energy;
- » The project would assist the South African government in the implementation of its green growth strategy and job creation targets;
- » The project would assist the district and local municipalities in reducing levels of unemployment through the creation of jobs and supporting local business;
- » Promotion of clean, renewable energy in South Africa;
- » Creation of local employment, business opportunities and skills development for the area.

Given South Africa's reliance on Eskom as a power utility, and Eskom's reliance on non-renewable energy sources, the benefits associated with Eskom also producing renewable energy is regarded as an important contribution to meeting national renewable energy and climate change targets. It also enables Eskom to support the demand side management energy efficiency programme as the proposed development represents an investment in clean, renewable energy infrastructure, which represents a positive social benefit for society as a whole.

PURPOSE AND OBJECTIVES OF THE EMPr

CHAPTER 3

An Environmental Management Programme (EMPr) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced”. The objective of this EMPr 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 EMPr 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 EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr 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 rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This Construction and Operational Environmental Management Programme (CEMPr and OEMPr) has been compiled for the proposed Tutuka PV Solar Energy Facility. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to, updated as relevant throughout the project life cycle.

This EMPr 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 EMPr 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 EMPr has the following objectives:

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

The management and mitigation measures identified within the Environmental Impact Assessment (EIA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Eskom must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the EIA process for the proposed Tutuka Solar PV Energy Facility, it is important that this document be read in conjunction with the final Scoping and EIA Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to, updated as relevant throughout the project life cycle.

STRUCTURE OF THIS EMPr

CHAPTER 4

The first two chapters provide background to the EMPr 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 Eskom as the project owner, 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 EMPr 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 EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

a). OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the EIA 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 EMPr.
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 EMPr 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.

The table below specifies plans required for the proposed project as specified by the DEA in the acceptance of the scoping report.

Table 4.1: Management plans for the proposed project

Plans required	Location in report
Layout and Sensitivity Map	Appendix A
Grievance Mechanism for Public Complaints and Issues	Appendix B
Waste Management Plan	Appendix C
Alien Invasive Species and Open Management Plan	Appendix D
Re-Vegetation and Habitat Rehabilitation Plan	Appendix E
Plant Protection and Rescue Plan	Appendix F
Traffic and Transportation Management Plan	Appendix G
Storm Water Management Plan	Appendix H
Erosion Management Plan	Appendix I
Tutuka Power Station Emergency Preparedness Plan (Fire Management)	Appendix J

4.1 Project Team

This EMPr was compiled by:

	Name	Company
EMPr Compilers:	Sandhisha Jay Narain Jo-Anne Thomas Jared Padavattan	Savannah Environmental
Specialists:	Marianne Strohbach and Michael Cohen (External reviewer)	Savannah Environmental
	Candice Hunter and Dr. Neville Bews (External reviewer)	Savannah Environmental
	John Marshall	Afzelia Environmental Consultants and Environmental Planning and Design
	Jaco van der Walt	Heritage Contracts and Archaeological Consulting CC (HCAC)
	Barry Millstead	BM Geological Services
	Garry Paterson	ARC-Institute for Soil, Climate and Water
	Robert Taylor	Limosella Consulting

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

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 5

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

- » National Environmental Management Act (Act No. 107 of 1998)
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 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)
- » Metsimaholo Municipality Integrated Development Plan
- » International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

International standards - Equator Principles.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in **Table 5.1**.

Table 5.1: Relevant legislative and permitting requirements applicable to the establishment of the proposed Tutuka Solar PV Energy Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	<p>The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations.</p> <p>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>In terms of GN R543, R544, R545 and R546 of December 2010, a Scoping and EIA Process is required to be undertaken for the proposed project.</p>	<p>National Department of Environmental Affairs – lead authority.</p> <p>Provincial Mpumalanga – Department of Economic Development, Environment and Tourism– (DEDET)</p>	The final EIA report is to be submitted to the DEA and Provincial Environmental Departments in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	<p>In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.</p> <p>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	Department of Environmental Affairs (as regulator of NEMA).	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs	Noise impacts are expected to be associated with the construction phase of the project and are not likely to

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
		Mpumalanga – Department of Economic Development, Environment and Tourism– (DEDET) Local Authorities	present a significant intrusion to the local community. There is no requirement for a noise permit in terms of the legislation.
National Water Act (Act No 36 of 1998)	<p>Water uses under Section 21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required).</p> <p>Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b.</p> <p>Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i.</p>	Department of Water Affairs & Sanitation (DWS)	<p>A water use license (WUL) is required to be obtained if water resources (such as wetlands or drainage lines) are impacted on, or if infrastructure lies within 500m of wetland features or the regulated area of a watercourse (being the riparian zone or the 1:100yr floodline whichever is greatest).</p> <p>Should water be extracted from groundwater/ a borehole on site for use within the facility, a water use license will be required in terms of Section 21(a) and 21 (b) of the National Water Act.</p>
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	<p>A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.</p> <p>Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.</p>	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.</p>		
<p>National Environmental Management: Air Quality Act (Act No 39 of 2004)</p>	<p>Sections 18, 19 and 20 of the Act allow certain areas to be declared and managed as “priority areas” in terms of air quality.</p> <p>Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.</p> <p>Section 32 makes provision for measures in respect of dust control.</p> <p>Section 34 makes provision for:</p> <p>(1) the Minister to prescribe essential national noise standards -</p> <p>(a) for the control of noise, either in general or by specified machinery or activities or in specified places or areas; or</p> <p>(b) for determining –</p> <p>(i) a definition of noise</p> <p>(ii) the maximum levels of noise</p> <p>(2) When controlling noise the provincial and local</p>	<p>National Department of Environmental Affairs – air quality</p> <p>Local Municipality - Noise</p>	<p>No permitting or licensing requirements applicable for air quality aspects.</p> <p>The section of the Act regarding noise control is in force, but no standards have yet been promulgated. Draft regulations have however, been promulgated for adoption by Local Authorities.</p> <p>An atmospheric emission licence issued in terms of Section 22 may contain conditions in respect of noise. This will however, not be relevant to the facility, as no atmospheric emissions will take place.</p> <p>The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>spheres of government are bound by any prescribed national standards.</p>		<p>person has failed to comply with the Act.</p>
<p>National Heritage Resources Act (Act No 25 of 1999)</p>	<p>Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including</p> <ul style="list-style-type: none"> » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » any development or other activity which will change the character of a site exceeding 5 000 m² in extent. <p>The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50m, or any development or other activity which will change the character of a site exceeding 5 000 m²; or the re-zoning of a site exceeding 10 000 m² in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided.</p> <p>Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component.</p>	<ul style="list-style-type: none"> » National Department of Environmental Affairs where heritage assessment is a component of the EIA » South African Heritage Resources Agency (SAHRA) – National heritage sites (grade 1 sites) as well as all historic graves and human remains. » Mpumalanga Heritage Resources Authority - Issue of permits for removal or destruction of heritage resources in the Mpumalanga Province 	<p>A permit may be required should cultural/heritage chance finds are discovered during construction.</p>
<p>National Environmental</p>	<ul style="list-style-type: none"> » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a 	<p>National Department of Environmental Affairs</p>	<p>A specialist flora and fauna assessment has been undertaken for the proposed</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Management: Biodiversity Act (Act No 10 of 2004)	threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » The Department of Environmental Affairs (DEA) published Regulations on Alien and Invasive Species (AIS) in terms of the National Environmental Management: Biodiversity Act, on Friday 1st August 2014. A total of 559 alien species are now listed as invasive, in four different	Mpumalanga – Department of Economic Development, Environment and Tourism– (DEDET)	project. A permit may be required should any listed plant species (be disturbed or destroyed as a result of the proposed development. NB: All list of protected vertebrate species (reptiles, birds, and mammals) that could occur in the study area according to the ADU and SANBI databases, as well as Apps (2000) is presented in Appendix C of the ecology report.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>categories. A further 560 species are listed as prohibited, and may not be introduced into the country</p>		
<p>Conservation of Agricultural Resources Act (Act No 43 of 1983)</p>	<ul style="list-style-type: none"> » Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Declared Weeds and Invaders in South Africa are categorised according to one of the following categories: <ul style="list-style-type: none"> » Category 1 plants: are prohibited and must be controlled. » Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread. » Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands. » These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E. 	<p>Department of Agriculture</p>	<ul style="list-style-type: none"> » While no permitting or licensing requirements arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. » The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. However, none of these activities are expected to be undertaken on site.
<p>National Forests Act (Act No. 84 of 1998)</p>	<ul style="list-style-type: none"> » Protected trees: According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that ` no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any 	<p>Department of Environmental Affairs</p>	<p>A permit or license is required for the destruction of protected tree species and/or indigenous tree species within a natural forest.</p> <p>No protected tree species were observed within or near the study area</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>protected tree, except under a licence granted by the Minister’.</p> <p>» Forests: Prohibits the destruction of indigenous trees in any natural forest without a licence.</p>		<p>and it is highly unlikely that any protected tree species would be impacted by the development.</p>
<p>National Veld and Forest Fire Act (Act 101 of 1998)</p>	<p>In terms of S12 the landowner must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.</p> <p>In terms of S17, the landowner must have such equipment, protective clothing, and trained personnel for extinguishing fires.</p>	<p>Department of Water Affairs</p>	<p>While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project. Due to the fire prone nature of the area, it must be ensured that the landowner and developer proactively manage risks associated with veld fires and provide cooperation to the local Fire Protection Agency.</p>
<p>Hazardous Substances Act (Act No 15 of 1973)</p>	<p>This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <p>» Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other</p>	<p>Department of Health</p>	<p>It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance;</p> <ul style="list-style-type: none"> » Group IV: any electronic product; » Group V: any radioactive material. <p>The use, conveyance or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>		
<p>National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014)</p>	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. <p>In terms of the Regulations published in terms of this Act (GN 921), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> » The containers in which any waste is stored, are intact and not corroded or in any other way 	<p>Hazardous Waste – National DEA General Waste –Mpumalanga DEDET</p>	<p>As no waste disposal facility is proposed, no waste license is required to be obtained. Should waste be stored on site, this will be required to be in terms of the Norms and Standards for Waste Storage (GN 926 of November 2013).</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>rendered unlit for the safe storage of waste.</p> <ul style="list-style-type: none"> » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented. 		
<p>National Road Traffic Act (Act No 93 of 1996)</p>	<ul style="list-style-type: none"> » The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations. 	<p>Provincial Department of Transport (provincial roads)</p>	<p>An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include:</p> <ul style="list-style-type: none"> » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Provincial			
The Nature Conservation Ordinance (NCO) 8 of 1969 and subsequent amendments	The Act provides for the conservation of fauna and flora and the hunting of animals causing damage and for matters incidental thereto	Mpumalanga Department of Economic Development, Environment and Tourism- (DEDET)	A permit may be required for flora and fauna removal, therefore this provincial legislation has been incorporated in this report and will remain applicable through the life cycle of the proposed project.

Table 5.2: Standards applicable to the Tutuka PV Solar Energy Facility project

Theme	Standard	Summary
Air	South African National Standard (SANS) 69	Framework for setting and implementing national ambient air quality standards
	SANS 1929: Ambient Air Quality	Sets limits for common pollutants
Noise	SANS 10328:2003: Methods for Environmental Noise Impact Assessments	General procedure used to determine the noise impact
	SANS 10103:2008: The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication	Provides noise impact criteria
	National Noise Control Regulations	Provides noise impact criteria
	SANS 10210: Calculating and Predicting Road Traffic Noise	Provides guidelines for traffic noise levels
Waste	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) – National norms and standard for the storage of waste. <ul style="list-style-type: none"> » Provides uniform national approach relating the management of waste facilities » Ensure best practice in management of waste storage » Provides minimum standards for the design and operation of new and existing waste storage 	
Water	Best Practise Guideline (G1) Storm Water Management DWA 2006	Provides guidelines to the management of storm water

Theme	Standard	Summary
	South African Water Quality Guidelines	Provides water quality guidelines

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 6

Overall Goal: undertake the pre-construction (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 pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- » 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 solar energy facility 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.

6.1 Objectives

a) OBJECTIVE 1: Ensure the facility design responds to identified environmental constraints and opportunities

The most sensitive landscape features for planning purposes in the study area will be the presence of the followings features on site:

Impacts on Ecology: The Tutuka PV Solar Energy facility development will not have significant impacts on the above-ground ecology of the site if all mitigation measures are followed, especially if listed alien invasives can be reduced. If present disturbances can be sufficiently mitigated, the impact may be to some extent beneficial for more sensitive surrounding areas. The low ecological sensitivity of the larger portion of the study area is due to the past land-use history, during which these areas were transformed or degraded. Potentially significant negative impacts on the ecological environment will occur if remaining portions of high diversity natural vegetation will be further disturbed. The impact on fauna is expected to be small to negligent. Presence of indigenous terrestrial vertebrates within the study area is low due to current land use. Animals that may be permanently present can be relocated, and may resettle after

construction, depending on safety specifications necessitated by the development. No restricted or specific habitat of vertebrates exists on the study area and will be affected by the proposed development; especially if the proposed development remains outside the recommended buffers around wetland and seepage areas.

The overall impact on the ecology (including flora and fauna) is likely to be of a medium significance prior to mitigation. This impact could be reduced to low-medium significance following the implementation of mitigation measures. It is not expected that the development will compromise the survival of or significantly impact any flora or terrestrial vertebrate species on the study area or beyond. The most significant impacts are expected to be on ecosystem health and functionality, which should remain relatively intact if all mitigation recommendations are implemented; and the associated integrity of surrounding wetlands maintained.

Impacts on Water Surface Water Resources:

Two wetlands were delineated on the study site both being unchannelled valley-bottom wetlands. The two wetlands in the study site are very similar in their function, type and ecology. They merge shortly downstream of the study area and as such they were assessed as one wetland for the purpose of these assessments.

The wetlands encroach onto the western section of Alternative Site 1 and the southern section of Alternative Site 2. From a wetland function point of view, development should ideally be confined to the central portion of Alternative Site 1, or the northern portion of Alternative Site 2. Alternative Site 1 is considered the most favourable for development of the PV facility since less wetland habitat will be lost. Overall the wetlands on site are largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred. The ecological importance and sensitivity suggests that wetlands in this category are considered to be ecologically important and sensitive on a provincial or local scale.

The overall impact on wetlands is likely to be of a medium significance prior to mitigation. This could be reduced to low negative significance following the implementation of mitigation measures, i.e. avoidance of the wetlands and associated 30 m buffer set to protect wetland functionality. With the proposed buffer, the proposed site is considered acceptable for development.

Opportunities to mitigate the negative impacts of large-scale PV developments largely arise during the planning and design stages. The correct choice of footprint location and layout is paramount, thus ecosystem components such as biodiversity and ecosystem function should be given full consideration during the design phase, as determined by the Environmental Impact Assessment.

The exact design of PV arrays (panel size, height, spacing, and nature of panels – tracking or fixed) can be equally important. The timing of pre-commencement, construction, maintenance and decommissioning activities also provides opportunities to reduce negative impacts on biodiversity.

Project Component/s	<ul style="list-style-type: none"> » PV Array » Grid connection and associated servitude » Access roads » Workshop, guardhouses, substation and other related infrastructure » Temporary construction camps » Protective fencing around development » Potential topsoil stockpiles
Potential Impact	<ul style="list-style-type: none"> » Placement of infrastructure that damages and degrades the environment unnecessarily, particularly with respect to habitat and wetland destruction, loss of indigenous flora, establishment, and persistence of alien invasive plants, and erosion.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of solar facility components and internal access routes » Positioning of workshop, guardhouses, substation and other related infrastructure » Alignment of power line servitude » Alignment of access roads to development » Positioning of temporary sites
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure selection of best environmental option for positioning alignment of proposed infrastructure » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Eskom EPC Contractor	Pre-construction
Avoid placement of infrastructure within functional wetland areas.	Eskom EPC Contractor	Pre-construction
Avoid placement of infrastructure within riparian vegetation around wetlands.	Eskom EPC Contractor	Pre-construction
Ensure that a 30 m buffer or more is maintained around the wetlands and their riparian vegetation to maintain the species diversity and buffering capacity of these wetlands surrounding riparian vegetation.	Eskom EPC Contractor	Pre-construction
Undertake pre-construction walk-through footprint	Eskom	Pre-

Mitigation: Action/Control	Responsibility	Timeframe
<p>investigations for protected flora and burrowing terrestrial vertebrates:</p> <p>The final footprint investigation (walkthrough) is aimed to fully inform the developer, responsible conservation authority (that will issue the relevant permits and authorisations), contractors, EO and ECO about:</p> <ul style="list-style-type: none"> » Protected species that will be affected by the development » Location of protected plant species within the footprint area – approximate mapping of areas of occurrence (alternatively, for linear structures, between which structures or other markers) » Identification of the affected species by providing a representative photo record that enables the ECO and contractors to identify such plants » How many specimens per species will be affected – relatively accurate estimate to the nearest 50, more accurate if less than 50 » Which species can be successfully relocated, which and how many will have to be destroyed » Location and nature of any nesting sites or active burrows of vertebrate species (birds, amphibians, reptiles and mammals), mapped by GPS, that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed person(s) » Nature of alien invasive species that will have to be cleared by the contractor » Location and nature of any other significant environmental concerns, e.g. extreme gully erosion, that will need to be addressed by the contractor to prevent any unnecessary (further) degradation of the development footprint 		construction
<p>The site-specific EMPr to be updated after the walk-through of the final footprint.</p>	Eskom/Specialist	Pre-construction
<p>The above pre-construction footprint investigations must be used together with results from the ecological specialist report to draft a comprehensive alien invasive species eradication and management plan (Basic requirements of these are listed under the Construction and Operation Phase EMPr)</p>	Eskom/Specialist	Pre-construction
<p>Obtain permits for protected plant removal and relocation from Mpumalanga Department of Economic Development, Environment and Tourism, and DAFF</p>	Eskom /Contractor	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
prior to commencement of any activity related to this development.		
<p>Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the EIA Report</p> <ul style="list-style-type: none"> » This includes positioning components of the development as close as possible together and in close proximity to other existing or planned developments in the area » Strictly adhere to existing tracks/roads where ever possible to gain access to the site » Sites for storing, mixing, and handling topsoil stockpiles (if necessary) or any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 500 m from any type of wetland. Such sites must be clearly indicated in site plans and the drafting of relevant detailed method statements and/or management plans requested from the relevant contractor or environmental firm. 	Eskom EPC Contractor	Pre-construction
Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of top soils, prevent obstruction or alteration of natural water flow	Eskom EPC Contractor	Design Phase
Compile a comprehensive storm water management and erosion control plan for the footprint area as part of the final design of the project. Basic requirements of these are listed under the Construction and Operation Phase EMP (refer to Appendix H)	Eskom EPC Contractor	Pre-Construction
Develop a comprehensive erosion control plan for the footprint area as part of the final design of the project (refer to Appendix I).	Eskom EPC Contractor	Design phase
<p>Permissible biodiversity:</p> <ul style="list-style-type: none"> » Depending on the final PV array and mechanism developed and taking all potential impacts, fire risks and maintenance requirements into consideration, it has to be decided upon and made clear: <ul style="list-style-type: none"> * Permissible vegetation: maximum height, desirable density and composition within the development area * Maintenance of this vegetation – mowing, 	Eskom /Specialist	Design phase

Mitigation: Action/Control	Responsibility	Timeframe
small livestock grazing, etc. Note: due to the hydrogeology to the area, there may be no application of herbicides		
After the permissible biodiversity has been determined, compile a comprehensive vegetation rehabilitation management plan (refer to Appendix E).	Eskom /Specialist	Preconstruction
Set realistic local recruitment targets for the construction phase .	Eskom EPC Contractor	Preconstruction/ construction
Submit a revised layout plan for the entire PV Solar Energy Facility for approval to the department prior to commencement of construction. This submission must be accompanied by confirmation from an environmental specialist that the sensitive areas identified within the EIA process have been avoided.	Eskom	Pre-construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Eskom	Pre-construction
An independent ECO must be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring at the DEA.	Eskom	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Final design meets environmental objectives. » Ecosystem fragmentation is kept to a minimum » Ecosystem functionality is retained and any unjustified disturbance and degradation prevented
Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and environmental specialist prior to the commencement of the activity.

b) OBJECTIVE: Ensure the selection of the best environmental option for the alignment of the power line and access roads

- » **Access Road** - Access to the site is provided from the R38 that runs to the east of the boundary of the proposed site and that connects the town of Standerton and Bethal. Internal access roads of up to 5-8 m wide will also be required. As material and components would need to be transported to the project site during the construction phase of the project, the accessibility of the site was a key factor in determining the viability of the project, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on project economics.
- » **Power line** - A new 11 kV (for connection at the station board) or 132 kV (for connection at HV yard) will be installed to facilitate the connection between the solar energy facility and the Eskom electricity grid.

Project Component/s	<ul style="list-style-type: none"> » Power line. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Route that degrades the environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, and erosion.
Activities/Risk Sources	<ul style="list-style-type: none"> » Alignment of power line. » Alignment of access roads.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure selection of best environmental option for alignment of linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Select a power line alignment within the preferred corridor assessed that curtails environmental impacts and enhances environmental benefits.	Eskom	Design
A designated access to the site must be created and clearly marked to ensure safe entry and exit.	Eskom EPC Contractor	Design
Consider design level mitigation measures recommended by the specialists as detailed within the EIA report and relevant appendices.	Eskom EPC Contractor	Design
Bird flight diverters must be installed as soon as the conductors are strung.	Eskom EPC Contractor	Design
Utilise existing roads as far as possible.	EPC Contractor	Design
Compile and implement a traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted (refer to Appendix G).	EPC Contractor	Pre-construction
The contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the	EPC Contractor	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
commencement of construction activities on site.		
Source general construction material and goods locally where available to limit transportation over long distances.	EPC Contractor	Pre-construction and construction
Appropriate external road management strategies must be implemented on and internal roads with all employees and contractors required to abide by standard road and safety procedures.	EPC Contractor (or appointed transportation contractor)	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Power line and 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 EIA Report through review of the design by the Project Manager, environmental specialist and the ECO prior to the commencement of construction.

c) OBJECTIVE: Minimise storm water runoff and wetland destruction (guideline for stormwater management plan)

Management of storm water will be required during the construction and operation phases of the facility. A detailed storm water management plan is required to be compiled as part of the final design to ensure compliance with applicable regulations and to prevent off-site migration of contaminated storm water or increased soil erosion. The section below provides a guideline for the management of storm water on site and will need to be supplemented with Appendix H and the relevant method statements during the construction and operation phases of the facility.

Project Component/s	<ul style="list-style-type: none"> » Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	<ul style="list-style-type: none"> » Poor storm water management and alteration of the hydrological regime
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
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Mitigation: Action/Control	Responsibility	Timeframe
The development footprint should avoid identified wetlands and wetland buffers.	Eskom	Design
A Method Statement for the management of storm water which also considers the recommendations below is to be compiled.	Contractor	Pre-construction
Design infrastructure in order to reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	Eskom EPC Contractor	Planning and design
Appropriately plan hard-engineered bank erosion protection structures.	Eskom EPC Contractor	Planning and design
Design an appropriate stormwater management plan to ensure the suitable handling of stormwater within the site (i.e. clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities).	Eskom EPC Contractor	Planning, Construction and operation
Design measures for storm water management need to allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Eskom EPC Contractor	Planning and design

Performance Indicator	» Appropriate storm water management measures included within the facility design.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and environmental specialist prior to the commencement of the activity.

d) OBJECTIVE: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operation phases of the solar energy facility. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» Solar energy facility » Associated infrastructure
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with solar energy facility construction » Activities associated with solar energy facility operation
Mitigation:	» Effective communication with affected and surrounding

Target/Objective	landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible
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Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in Appendix B) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Eskom EPC Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Eskom EPC Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)

Performance Indicator	» Effective communication procedures in place.
Monitoring	» A Public Complaints register must be maintained, by the Contractor and monitored by the ECO, to record all complaints and queries relating to the project and the action taken to resolve the issue. » All correspondence should be in writing

MANAGEMENT PROGRAMME: CONSTRUCTION

CHAPTER 7

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 remaining indigenous natural vegetation and habitats of ecological value.
- » 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.

7.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, Eskom 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 EMPr, and the implementation of the EMPr through its integration into the contract documentation. Eskom will retain various key roles and responsibilities during the construction of the facility.

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

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. Formal responsibilities are necessary to ensure that key procedures are executed. Figure 7.1 provides an organogram indicating the organisational structure for the implementation of the EMPr.

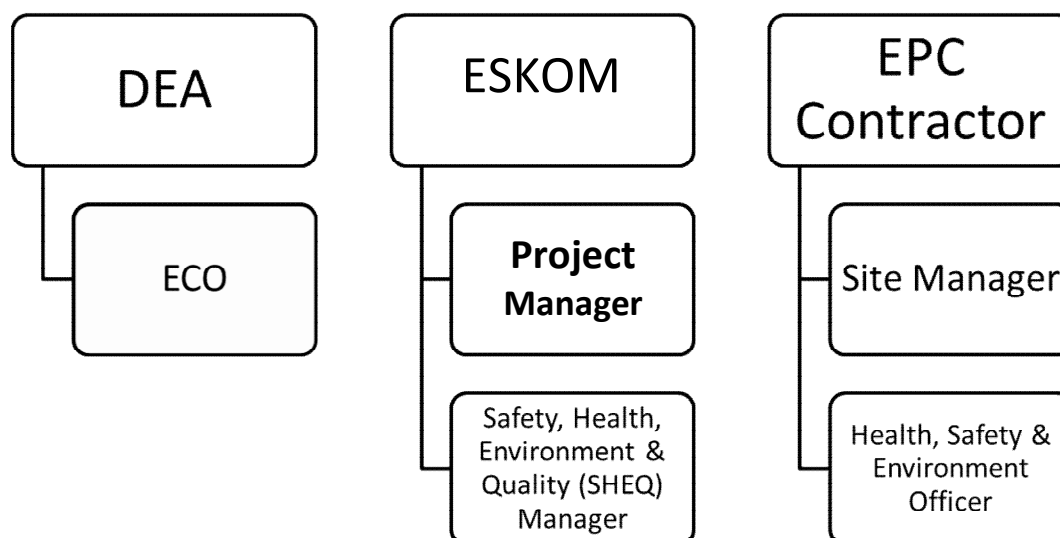


Figure 7.1: Organisational structure for the implementation of the EMPr

Project Manager:

- » 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 Eskom and its Contractor(s) are made aware of all stipulations within the EMPr.
- » Ensure that the EMPr 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 knowledgeable with the EIA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant licences and permits.
- » Be fully knowledgeable with the contents of all relevant licences and permits.

Site Manager (EPC Contractor's on-site Representative) will:

- » Be fully knowledgeable with the contents of the EIA and risk management.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the EMPr.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMPr and its implementation.
- » Conduct audits to ensure compliance to the EMPr.

- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Be fully knowledgeable with the contents of all relevant licences and permits.
- » 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.

An independent **Environmental Control Officer (ECO)** must be appointed by Eskom prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the EIA.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation.
- » Be fully knowledgeable with the contents with the EMPr.
- » Be fully knowledgeable of all the licences and permits issued to the site.
- » 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 EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » 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.
- » Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Ensure that the compilation of progress reports for submission to the Technical Director, 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.
- » Submit independent reports to the DEA and other regulating authorities regarding compliance with the requirements of the EMPr, EA and other environmental permits.

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with

construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient. However, in the absence of the ECO there should be a designated owner's environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

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 EMPr. 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 EMPr must be easily accessible to all on-site staff members.
- » Employees must be familiar with the requirements of this EMPr 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 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 EMPr.
- » 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 EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

Contractor’s Safety, Health and Environment Representative: The Contractor’s Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

The Contractor’s Safety, Health and Environment Representative should:

- » Be well versed in environmental matters.
- » Understand the relevant environmental legislation and processes.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- » Know the background of the project and understand the implementation programme.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- » Keep accurate and detailed records of all EMPr-related activities on site.

7.2 Objectives

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

a) OBJECTIVE: Minimise impacts related to inappropriate site establishment

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. PV panels, and substation). » Linear infrastructure (i.e. power line, and access roads).
Potential Impact	<ul style="list-style-type: none"> » Hazards to the public. » Damage to wetlands and indigenous natural vegetation. » Loss of threatened plant 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:	» To secure the site against unauthorised entry.
Target/Objective	» To protect members of the public/landowners/residents. » No loss of or damage to wetlands and 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 Site Manager, SHE Representative/EO.	EPC Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	EPC Contractor	Site establishment, and duration of construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.	EPC Contractor	Site establishment, and duration of construction contract
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 and any other relevant local languages, all to the approval of the Site Manager.	EPC Contractor	Site establishment, and duration of construction contract
Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.	EPC Contractor	Site establishment
As far as possible, minimise natural and semi-natural vegetation clearing for equipment storage areas. Aim to locate the temporary construction camps on already degraded and/or heavily disturbed areas.	EPC Contractor	Site establishment
Fence and secure contractor's equipment camp.	EPC Contractor	Site establishment
Electric fencing should not have any strands within 30cm of the ground, which should be sufficient to allow smaller mammals, reptiles and tortoises to pass through, but still remain effective as a security barrier.	EPC Contractor	Site establishment
Develop an efficient access control system which allows for the identification of all people on site	EPC Contractor	Site establishment and duration of contract
Establish an appropriate Hazardous Store which is in	EPC Contractor	Site

Mitigation: Action/Control	Responsibility	Timeframe
accordance to the Hazardous Substance Amendment Act, No. 53 of 1992 this should include but not limited to: <ul style="list-style-type: none"> » Designated area; » All applicable safety signage; » Fire fighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents. 		establishment
All unattended open excavations must be adequately demarcated and/or fenced (Plastic/ metal, red and white danger chains must be used to demarcate areas.	EPC 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.	EPC Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities should not be located within 100 m from a watercourse/wetland or within the 1:100 year flood line.	EPC Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured Tarp/netting or shade-cloth) at site where construction is being undertaken. Separate labelled bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	EPC Contractor	Site establishment, and duration of construction

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is 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 EMPr. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances must be immediately reported to the site manager.

b) OBJECTIVE: Appropriate management of the construction site and construction workers

The construction phase of the PV facility is expected to extend over a period of 15-18 months. Workers not residing in the area, including those required for skilled positions will be transported to site on a daily basis and will not be housed on site. However, the security team will be required on site at all times.

Construction equipment and machinery may need to be stored at an appropriate location on the site for the duration of the construction period, and temporary staff facilities will have to be made available.

Project Component/s	<ul style="list-style-type: none"> » Construction equipment camps » Facilities for storing, mixing and general handling of materials » Access roads
Potential Impact	<ul style="list-style-type: none"> » Damage to indigenous natural vegetation; » Damage to and/or loss of topsoil; » Initiation of accelerated erosion; » Compacting of ground; and » Pollution of the surrounding environment due to inadequate or inappropriate facilities or procedures
Activities/Risk Sources	<ul style="list-style-type: none"> » Vegetation clearing and levelling of temporary construction or storage area/s. » Transport to and from the temporary construction or storage area/s. » Types of materials or equipment and the manner in which they are stored or handled.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise impacts on the biophysical environment » To prevent any residual or cumulative impacts arising from temporary construction or storage areas

Mitigation: Action/Control	Responsibility	Timeframe
The location of the construction equipment camp and all access routes must take cognisance of any ecologically sensitive areas identified.	EPC Contractor	Pre-construction
The location of the construction equipment camp must be outside of identified sensitive areas.		
No temporary site camps may be established outside the footprint of the development area.	EPC Contractor	Construction
To minimise the footprint, temporary storage of equipment and materials on site should be kept to a minimum.	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Staff must be supplied with adequate facilities aimed at preventing any kind of pollution.	EPC Contractor	Construction
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	EPC Contractor and sub-contractor/s	Duration of contract
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	EPC Contractor and sub-contractor/s	Duration of contract
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.	EPC Contractor	Site establishment, and duration of construction
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas.	EPC Contractor and sub-contractor/s	Duration of contract
Sub-Contractors appointed by the Contractor must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the EMP and EA	EPC Contractor and sub-contractor/s	Construction
<p>To limit the excessive clearance and destruction of vegetation the following must be implemented:</p> <ul style="list-style-type: none"> » Identify and demarcate construction areas, servitudes, and access for general construction work and restrict construction activity to these areas. » Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling) » Create specific turning points and parking areas for vehicles and heavy machinery as needed » Strictly prohibit any driving outside designated areas and roads 	EPC Contractor	Before and during construction
<p>To limit the possible distribution of undesirable species and possible pollutants onto site:</p> <ul style="list-style-type: none"> » Do not wash down any machinery or vehicle within the footprint area, unless in a designated wash bay area. » All materials moved onto the development site must be free of weeds or any other undesirable 	EPC Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
organisms or pollutants » It is recommended that fuels, lubricants and other chemicals only be stored on site if absolutely necessary, and then in a manner that prevents any accidental spillage		
Rehabilitate and re-vegetate all disturbed areas at the construction equipment camp as soon as construction is complete within an area and mitigate erosion where required as per specific management plans	EPC Contractor, rehabilitation contractor	Construction
All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrows pits. Solid waste (general waste) is to be transported to a licensed disposal facility (waste should be disposed at a major waste disposal centre) for safe disposal by a permitted service provider. Waste Manifests must be retained as proof of responsible disposal and consolidated in a Waste Register.	EPC Contractor	Site establishment, and duration of construction
Hazardous substances and hazardous waste: Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered h:H or H:H landfill site. Depending on the classification of the waste, a registered service provider with the necessary permits is to collect, transport and dispose of hazardous waste. Proof of appropriate disposal to be provided to the SHE Representative.	EPC Contractor	Site establishment, and duration of construction

Performance Indicator	<ul style="list-style-type: none"> » No visible erosion scars or any pollution once construction in an area is completed » All damaged areas successfully rehabilitated one year after completion » No damage to drainage lines or other types of water resource areas » Appropriate waste management
Monitoring	<ul style="list-style-type: none"> » Regular monitoring and audits of the construction camps and temporary structures on site by the ECO » A photographic record must be established before, during and after mitigation » An incident reporting system must be used to record non-conformances to the EMPr, followed by the necessary action from Eskom to ensure full compliance

c) OBJECTIVE: Maximise local employment, skill development and business opportunities associated with the construction phase

Although limited, employment opportunities could be created during the construction phase (i.e. ~250-300), specifically for semi-skilled and unskilled workers. The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment. 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 of the proposed Tutuka solar energy facility and associated infrastructure
Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activity/risk source	The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
Mitigation: Target/Objective	Eskom should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors.

Mitigation: Action/control	Responsibility	Timeframe
Employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria, where possible.	Eskom EPC Contractor	Preconstruction/ construction
Adopt a local employment policy to maximise the opportunities made available to the local labour force	Eskom EPC Contractor	Preconstruction/ construction
In the recruitment selection process; consideration must be given to women during recruitment process	Eskom EPC Contractor	Preconstruction/ construction
Training and skills development programmes to be initiated prior to the commencement of the construction phase	Eskom EPC Contractor	Preconstruction/ construction
Source as much goods and services as possible from the local area (Lekwa Local Municipality). Engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and	Eskom	Pre-construction & construction phase

products from local suppliers where feasible		
Develop a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) prior to the tender process and invite them to bid for project-related work where applicable	Eskom EPC Contractor	Pre-construction & construction phase

Performance Indicator	<ul style="list-style-type: none"> » Employment and business policy document that sets out local employment and targets completed before construction phase commences; » Employ as many semi and unskilled labour from the local area or local municipality as possible » Training and skills development programme undertaken prior to the commencement of construction phase.
Monitoring	<ul style="list-style-type: none"> » The developer and EPC contractor must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes.

d) OBJECTIVE: Avoid the potential impacts on family structures and social networks associated with presence of construction workers from outside the area

Even though the inflow of jobseekers is likely to occur, the probability of this issue becoming problematic and resulting in severe negative social impacts is seen to be improbable.

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	Construction activities associated with the establishment of the solar energy facility, including infrastructure etc.
Potential Impact	The presence of construction workers who live outside the area and who are housed in local towns can impact on family structures and social networks.
Activity/risk source	The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.

Mitigation: Target/Objective	To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.
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Mitigation: Action/control	Responsibility	Timeframe
The majority of the low-skilled workers should be sourced from the local area. This should be included in the tender documents. Construction workers should be recruited from the local area	EPC Contractor	Pre-construction/ construction
Identify local contractors who are qualified to undertake the required work.	EPC Contractor	Pre-construction/ construction
Develop a Code of Conduct to cover the activities of the construction workers housed on the site.	EPC Contractor	Pre-construction/ construction
Ensure that construction workers attend a brief session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	EPC Contractor	Pre-construction/ construction
Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	EPC Contractor	Pre-construction/ construction
Ensure that construction workers who are found guilty of breaching the Code of Conduct are disciplined accordingly. All disciplinary hearings and/or dismissals must be in accordance with South African labour legislation.	EPC Contractor	Construction
Provide opportunities for workers to go home over weekends.	EPC Contractor	Construction
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.	EPC Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Employment policy and tender documents that sets out local employment and targets completed before construction phase commences. » Majority of semi and unskilled labour locally sourced where possible. » Code of Conduct drafted before commencement of construction phase. » Briefing session with construction workers held at outset of construction phase.
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Monitoring	» The proponent and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.
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e) OBJECTIVE: To address safety and security issues during the construction phase

An inflow of workers could, pose some security risks. Criminals could also use the opportunity due to “outsiders” being in the area to undertake their criminal activities.

Project component/s	Construction of the proposed Tutuka solar energy facility and associated infrastructure
Potential Impact	Safety and security issues (such as increase in crime, increased fire risk) due to influx of non-local workforce and job seekers into the area
Activity/risk source	Safety and security risks associated with construction activities
Mitigation: Target/Objective	To avoid or minimise the potential impact on local communities and their livelihoods

Mitigation: Action/control	Responsibility	Timeframe
Access in and out of the construction site should be strictly controlled by a reputable security company	EPC contractor	Construction Phase
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas. Heating of bitumen for application must be done in a designated area as approved by the ECO and HS Manager.	EPC contractor	Construction phase
Contractor must provide adequate fire fighting equipment on site and provide fire fighting training to selected construction staff.	EPC contractor	Construction phase
A comprehensive employee induction programme to be developed and utilised to cover land access protocols, fire management and road safety	EPC contractor	Construction phase
Method of communication should be implemented whereby local landowners can express any complaints or grievances with the construction process. A Community Liaison officer should be appointed as a grievance mechanism.	EPC Contractor	Construction phase

Performance Indicator	» Employee induction programme, covering land access protocols, fire management and road safety in place
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	<ul style="list-style-type: none"> » The construction site is appropriately secured with a controlled access system » Security company appointed and security procedures implemented » Designated areas for fires identified on site at the outset of the construction phase. » Fire fighting equipment and training provided before the construction phase commences. » Proven compensation claims settled within 1 month of claim being verified by Project Manager.
Monitoring	<ul style="list-style-type: none"> » The developer and EPC contractor must monitor the indicators listed above to ensure that they have been met for the construction phase

f) OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site (Traffic Management and Transportation Plan)

The construction phase of the project will be the most significant in terms of generating traffic impacts, resulting from the transport of equipment (including turbine components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary and external works outside the site boundary.

Access to the site is provided from the R38 that runs to the east of the boundary of the proposed site and that connects the town of Standerton and Bethal. Internal access roads of up to 5-8 m wide will also be required. As material and components would need to be transported to the project site during the construction phase of the project, the accessibility of the site was a key factor in determining the viability of the project, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on project economics.

The section below provides a guideline for the Traffic Management and Transportation Plan on site and will need to be supplemented with the relevant final transport plan devised by the EPC partner during the final design phase of the facility.

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. » Foundations or plant equipment installation. » Transportation of ready-mix concrete from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Power line and substation construction activities.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise impact of traffic associated with the construction of the facility on local traffic volume, 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
Implement the traffic management plan (compiled during design phase) for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted (refer to Appendix G).	EPC Contractor	Construction
The contractor's 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.	EPC Contractor	Pre-construction/ Construction
Source general construction material and goods locally where available to limit transportation over long distances.	EPC Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	EPC Contractor	Construction
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	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
working order and not overloaded.		
Strict vehicle safety standards should be implemented and monitored.	EPC Contractor	Construction
Ensure All relevant permits for abnormal loads are obtained from the relevant authority before activity commences.	EPC Contractor (or appointed transportation contractor)	Pre-construction/ Construction
A designated access to the proposed site must be created to ensure safe entry and exit. Access should not be e located on a blind rise or bend.	EPC Contractor	Pre-construction/ Construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	EPC 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.	EPC Contractor (or appointed transportation contractor)	Pre-construction/ Construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	EPC Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	EPC 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). Signage must be appropriately maintained for the duration of the construction period.	EPC Contractor	Duration of contract
Provide adequate and strategically placed traffic warning signs and control measures along the R38 and secondary roads to warn road users of the construction activities taking place, displaying road safety messages and speed limits for the duration of the construction phase. Traffic warning signs must also be well illuminated at night.	EPC Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	EPC 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.	EPC Contractor	Duration of contract
Keep new hard road surfaces as narrow as possible.	EPC Contractor	Duration of contract
To minimise impacts on local communities, consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.	EPC 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"> » The SHE Representative/EO must monitor indicators listed above to ensure that they have been implemented.

g) OBJECTIVE: Effective management of concrete batching

Concrete is required during the construction of the solar energy facility. The bulk of the concrete will be supplied via ready mix trucks, with minimal concrete being mixed/batched on site.

Project component/s	<ul style="list-style-type: none"> » Batching of concrete
Potential Impact	<ul style="list-style-type: none"> » Dust emissions » Release of contaminated water » Generation of contaminated wastes from used chemical containers/cement bags » Inefficient use of resources resulting in excessive waste generation
Activity/risk source	<ul style="list-style-type: none"> » batching of concrete on unprotected ground » Packaging and other construction wastes » Storage of cement bags
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

Mitigation: Action/control	Responsibility	Timeframe
Batching of concrete must be undertaken on an impermeable surface (e.g. batching boards) to avoid ground contamination and pollution to surrounding environments.	EPC Contractor	Construction phase
Where possible, waste concrete should be re-used for construction purposes at the project site.	EPC Contractor	Construction phase
Empty cement bags should be collected and disposed appropriately as hazardous waste.	EPC Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
Washing of ready mix trucks and chutes are prohibited onsite unless in designated wash bay.	EPC Contractor	Construction phase

Performance Indicator	<ul style="list-style-type: none"> » No complaints on dust » No water or soil contamination by chemical 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 » Observation and supervision of batching of concrete » Developer or appointed EO and ECO must monitor indicators listed above to ensure that they have been met for the construction phase

h) OBJECTIVE: To avoid and or minimise the potential impacts of noise and dust and damage to roads caused by construction vehicles during the construction phase

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 main and internal access roads.

Project component/s	Construction and establishment activities associated with the establishment of the solar energy facility, including infrastructure etc.
Potential Impact	Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activity/risk source	The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation: Target/Objective	To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and also minimise damage to roads.

Mitigation: Action/control	Responsibility	Timeframe
Areas to be cleared in a progressive manner. Road surfaces and other infrastructure to be constructed as soon as possible after vegetation clearing in order to minimise exposed ground surfaces, specifically roads which carry traffic.	EPC Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Implement dust suppression measures for heavy vehicles such as, for example, wetting roads on a regular basis.	EPC Contractor	Pre-construction/ construction
Ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers when on public roads.	EPC Contractor	Construction
Ensure that all vehicles are road-worthy, drivers are qualified and are made aware of the potential noise, dust and safety issues.	EPC Contractor	Pre-construction/ construction
Ensure that drivers adhere to speed limits. Site security must monitor the speeds along the access roads and speeding drivers must be disciplined accordingly.	EPC Contractor	Pre-construction/ construction
Ensure that any damage to roads is repaired before completion of construction phase.	EPC Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Dust suppression measures implemented for all access roads 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. » 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"> » The proponent and or appointed ECO with assistance from the EO must monitor indicators listed above to ensure that they have been met for the construction phase.

i) OBJECTIVE: Minimisation of soil erosion and disturbance to topsoil and soil degradation

Compacted and/or denuded and disturbed soils are usually prone to surface capping – even more so if the soils are dispersive or have a fine texture due to higher clay or loam contents. Such capped soils are prone to ever increasing erosion, creating a dysfunctional landscape and ecosystem that rapidly loses soil, nutrients and seeds from the ecosystem.

Naturally occurring grassland vegetation not only protects the soil surface from direct raindrop impact, but high portion of biomass in the upper 20 – 50 cm of the soil significantly increases rapid infiltration of rainwater, whilst also binding soil particles and thus preventing erosion. A highly disturbed or reduced vegetation layer will thus naturally be accompanied by higher runoff levels and accelerated erosion, especially during extreme weather events.

Topsoil conservation is an integral part of rehabilitation efforts and helps to maintain the productive capability and ecological functionality of rangelands.

Removal of topsoil should be done where:

- » Areas will be excavated
- » Areas will be severely compacted
- » Areas will be buried with excavated material
- » Areas will be permanently covered with altered surfaces

Topsoil must at all times be treated as a valuable natural resource, and may thus not be discarded or degraded. The measures below indicate the minimum mitigation that will be required for Topsoil management and erosion control.

Project Component/s	<ul style="list-style-type: none"> » PV Array supports and trenching » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Potential topsoil stockpiles and/or borrow pits
Potential Impact	<ul style="list-style-type: none"> » Loss of topsoil and natural resources and biological activity within the topsoil » Loss of natural regeneration potential of soils » Loss of agricultural potential of soils.
Activity/Risk Source	<ul style="list-style-type: none"> » Rainfall and wind erosion » Site preparation and earthworks » Excavation of foundations and trenches » Construction of site access road » Power line construction activities » PV array construction activities » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To retain full biological activity and functionality of topsoil » To retain desirable 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 » To minimise erosion of soil from site during construction » To minimise deposition of soil into drainage lines » To minimise damage to vegetation by erosion or deposition » To minimise damage to rock, soil, animals and vegetation by construction activity » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover » No reduction in the surface area of natural drainage lines and other wetland areas as a result of the establishment of

	infrastructure » No increase in runoff into drainage lines as a result of construction of project related infrastructure » No increase in runoff into drainage lines as a result of road construction
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Mitigation: Action/Control	Responsibility	Timeframe
The unnecessary clearance of vegetation must be prohibited. » Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary disturbance. » All woody material cleared must be shredded to coarse chips, if possible to be used as mulch. Where this is not financially feasible, then all organic matter must be stockpiled for later use in rehabilitation activities.	EPC Contractor in consultation with Specialist	Pre-construction/Construction
Construction activities must be restricted to demarcated areas so that impact on topsoil is minimised.	EPC Contractor	Pre-construction, Construction and Operational phase
Salvaging topsoil: » Topsoil must always be salvaged and stored separately from subsoil and lower-lying parent rock or other spoil material. <ul style="list-style-type: none"> ○ Topsoil stripping removes up to 30 cm or less of the upper soils. » Prior to salvaging topsoil the depth, quality and characteristics of topsoil should be known for every management area. <ul style="list-style-type: none"> * This will give an indication of total volumes of topsoil that need to be stored to enable the proper planning and placement of topsoil storage. * Different types of topsoil – rocky soils and sands or loams must be stored separately » Topsoil should be removed (and stored) under dry conditions to avoid excessive compaction whenever topsoil will have to be stored for longer than one year.	EPC Contractor	Pre-construction/Construction
Storing topsoil: » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity	Contractor	Pre-construction/Construction

Mitigation: Action/Control	Responsibility	Timeframe
<p>necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil.</p> <ul style="list-style-type: none"> » Stockpile location if not adjacent to a linear development: <ul style="list-style-type: none"> * At least 50 m from any wetland or watering point * Ideally a disturbed but weed-free area » Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower <ul style="list-style-type: none"> * Place berms along contours or perpendicular to the prevailing wind direction * Adhere to the following general rule: the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored » Topsoil handling should be reduced to stripping, piling (once), and re-application. Between the stockpiling and reapplication, stored topsoil should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches <ul style="list-style-type: none"> * In such case, use one side of the linear development for machinery and access only * Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile) * If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: <ul style="list-style-type: none"> * Preventing ponding on or between heaps of topsoil * Or covering topsoil berms * Preventing all forms of contamination or pollution * Preventing any form of compaction * Monitoring establishment of all invasive vegetation and removing such if it appears 		

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> * Keeping heights of topsoil at 2m to prevent wind erosion * Keeping slopes of topsoil at a maximal 2:1 ratio * Monitoring and mitigating erosion where it appears * Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered 		
<p>Reapplying topsoil:</p> <ul style="list-style-type: none"> » Spoil materials and subsoil must be back-filled first, then covered with topsoil » Generally, topsoil should be re-applied to a depth equal to slightly greater than the topsoil horizon of a pre-selected undisturbed reference site » The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm » If the amount of topsoil available is limited, a strategy must be worked to out to optimise re-vegetation efforts with the topsoil available » Reapplied topsoil should be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture levels where the seeds are likely to be more concentrated. This greatly improves the success rate of re-vegetation efforts. » To stabilise reapplied topsoil and minimise raindrop impact and erosion: <ul style="list-style-type: none"> o Use organic material from cleared and shredded woody vegetation where possible o Alternatively, suitable geotextiles or organic erosion mats can be used as necessary » Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation 	EPC Contractor	Pre-construction/ Construction
<p>Re-applied topsoil needs to be re-vegetated as soon as possible, following the specifications of the re-vegetation and rehabilitation plan.</p>	EPC Contractor	Construction monitored during operational phase
<p>General Erosion control measures:</p> <ul style="list-style-type: none"> » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade 	EPC Contractor	Construction monitored during operational

Mitigation: Action/Control	Responsibility	Timeframe
<p>nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas</p> <ul style="list-style-type: none"> ○ Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water. » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. » Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction. » Storm water and any runoff generated by hard impervious surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. » Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion. » Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation. » Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment » If implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water 		phase
<p>Implement storm water management method statement, as part of the final design of the project</p>	EPC Contractor	Construction monitored

Mitigation: Action/Control	Responsibility	Timeframe
and implement during construction and operation		during operational phase
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	EPC Contractor	Construction monitored during operational phase
All vehicles on site must be appropriate to access the site. No off-road driving is permitted.	EPC Contractor	Construction monitored during operational phase
4x4s or diff lock vehicles must be used in wet slippery conditions to reduce the erosion on the roads and the surrounding area.	EPC Contractor	Construction monitored during operational phase

Performance Indicator	<ul style="list-style-type: none"> » Minimal disturbance outside of designated work areas. » Topsoil appropriately stored, managed, and rehabilitated. » Minimal level of soil erosion around site » Minimal level of increased siltation in drainage lines » Minimal level of soil degradation » Acceptable state of excavations, as determined by EO & ECO » Progressive return of disturbed and rehabilitated areas to the desired end state (Refer also to the Plant Rescue and Protection Plan and Re-vegetation and Habitat Rehabilitation Plan)
Monitoring	<ul style="list-style-type: none"> » Monitoring of appropriate methods of vegetation clearing and soil management activities by ECO with assistance from the EO throughout construction phase. » Regular monitoring of topsoil after construction by developer until such topsoil can be regarded as fully rehabilitated, stable and no longer prone to accelerated erosion » Inspections of sediment control devices by ECO with assistance from the EO » Inspections of surroundings, including drainage lines by ECO with assistance from the EO. » Immediate reporting of ineffective sediment control systems

j) OBJECTIVE: Minimise loss of indigenous biodiversity, including plants of conservation concern

Prior to commencement of any activity, including earthworks (grading, road construction, etc.) within areas of natural vegetation a plant Search and Rescue program should be developed and implemented, preceded by a meticulous investigation of all footprint areas by a suitably qualified botanist, conducted during the optimal growing season (January to March) along the entire footprint area. A permit may be required should any listed plant species be disturbed or destroyed as a result of the proposed development.

Project Component/s	<ul style="list-style-type: none"> » PV Array » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Temporary construction camps » Protective fencing around development » Potential topsoil stockpiles and/or borrow pits
Potential Impact	<ul style="list-style-type: none"> » Substantially increased loss of species of conservation concern and other natural vegetation at construction phase, waste of on-site plant resources, lack of locally sourced material for rehabilitation of disturbed areas; » Increased cost of rehabilitation
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction related loss and damage to remaining natural and semi-natural vegetation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Rescue, maintenance and subsequent replanting of at least all bulbous protected plant species within the specific land portion

Mitigation: Action/Control	Responsibility	Timeframe
All development footprints within areas of natural vegetation (for roads, buildings, underground cables, laydown areas and panel foundations) should be surveyed and appropriately fenced off. Only once this has been done can any construction activity proceed.	EPC Contractor	Duration of construction
Search and Rescue (S&R) of all protected plants that will be affected by the development, especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. The necessary permits must be in place <ul style="list-style-type: none"> » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue 	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
<p>experience should be appointed to undertake the S&R.</p> <ul style="list-style-type: none"> » All rescued species should be transplanted immediately as soon as possible. Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment. » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment 		
<p>It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas.</p>	EPC Contractor	Duration of construction
<p>Minimise large-scale clearance of natural vegetation and disturbance to the proposed site.</p>	EPC Contractor	Duration of construction
<p>Use existing and dedicated access roads to limit disturbance of the natural vegetation.</p>	EPC Contractor	Duration of construction
<p>Minimise damage to natural vegetation beyond the site during the construction of the power line and access road.</p>	EPC Contractor	Duration of construction
<p>Rehabilitate disturbed areas on completion of the construction phase. Details of the rehabilitation programme should be contained in the relevant EMPr. Rehabilitation targets must be set according to the original vegetation as described in the ecological specialist report.</p>	EPC Contractor	Duration of construction
<p>Prevent soil erosion originating from the site, according to soil erosion management plan.</p>	EPC Contractor	Duration of construction
<p>Monitor and control declared weeds and invader species.</p> <ul style="list-style-type: none"> » Continually monitor the re-emergence of these species and manage according to the invasive species management plan 	EPC Contractor	Duration of construction
<p>All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity.</p> <ul style="list-style-type: none"> » The trenches must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed by a suitably qualified person in a safe manner, unharmed, and placed in an area where the animal will be comfortable. <p>All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either</p>	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
be put down in a humane manner or cared for until it can be released again		

Performance Indicator	<ul style="list-style-type: none"> » Rescue and relocation of species of conservation concern » No damage or injury to fauna » Re-establishment of rescued species
Monitoring	<ul style="list-style-type: none"> » Minimal loss or disturbance of natural vegetation in and around the site. » Vehicles drive on dedicated roads with no disturbance of the surrounding natural vegetation. » Damage to the natural vegetation is minimised during the construction of associated infrastructure such as the power line and access roads. » ECO to monitor Search and Rescue, continue search and rescue operations during the construction process where it becomes necessary after the initial S&R » It may be possible that geophytic species may emerge during construction that were not accounted for in the original S&R plan – once observed the ECO should consult the botanists on the identification and possible S&R for those plant species

k) OBJECTIVE: Minimising the impact on Heritage sites

All development footprints within areas of natural vegetation (for roads, buildings, underground cables, laydown areas and panel foundations) should be surveyed and appropriately fenced off. Only once this has been undertaken can any construction activity proceed. It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas, at least not without the permission of the ECO.

Project Component/s	Solar Array, roads, power line and substation
Potential Impact	Discovery of graves
Activity/Risk Source	Solar array foundations, power line, substation foundations and roads
Mitigation: Target/Objective	Conserve fossil sites

Mitigation: Action/Control	Responsibility	Timeframe
Periodic monitoring of excavation activities during the construction period to ensure that no sub-surface	EPC Contractor in consultation	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
deposits are missed.	with Specialist	
<p>A chance find procedure must be adopted if any graves or fossils finds are discovered during clearing of site and excavation. The procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this EMP and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.</p> <ul style="list-style-type: none"> » If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any grave site, artefact of cultural significance or rock engraving, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. » It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. » The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The EO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA. 	EPC Contractor in consultation with Specialist	Duration of construction

Performance Indicator	» No destruction of archaeological sites
Monitoring	» Monitoring of excavations during construction phase

l) OBJECTIVE: Minimise the establishment and spread of alien invasive plants (Invasive Plant Management Plan) and manage indigenous invasive plants

Within the project area invasive species – indigenous and alien - occur, which all have a potential of reproducing to such an extent that the ecosystem within and

beyond the project area could be impaired. A total of 25 alien invasive species have been recorded on the proposed site.

Project Component/s	<ul style="list-style-type: none"> » Permanent and temporary infrastructure » Access roads
Potential Impact	<ul style="list-style-type: none"> » Impacts on natural vegetation » Impacts on soil » Impact on faunal habitats » Degradation and loss of agricultural potential
Activity/Risk Source	<ul style="list-style-type: none"> » Transport of construction materials to site » Movement of construction machinery and personnel » Site preparation and earthworks causing disturbance to indigenous vegetation » Construction of site access road » Stockpiling of topsoil, subsoil and spoil material » Routine maintenance work – especially vehicle movement
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To significantly reduce the presence of weeds and eradicate alien invasive species » To avoid the introduction of additional alien invasive plants to the project control area » To avoid further distribution and thickening of existing alien plants on the project area » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the project control area

Mitigation: Action/Control	Responsibility	Timeframe
Compile a detailed invasive plant management and monitoring programme as guideline for the entire construction, operational and decommissioning phase <ul style="list-style-type: none"> » This plan must contain WfW (Working for Water) - accepted species- specific eradication methods » It must also provide for a continuous monitoring programme to detect new infestations 	Specialist	Pre-construction
Avoid creating conditions in which invasive plants may become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Shred all non-seeding material from cleared invasive shrubs and other vegetation and use as mulch as part of the rehabilitation and re-vegetation plan » Where possible, destroy seeding material of weeds and invasives by piling burning (in designated areas or suitable containers) » Do not import soil from areas with alien plants 	EPC Contractor	Construction phase Operational phase

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Eradicate all invasive plants that occur within the development's temporary and permanent footprint areas » Ensure that material from invasive plants that can regenerate – seeds, suckers, plant parts are adequately destroyed and not further distributed 	EPC Contractor	Construction phase Operational phase
<ul style="list-style-type: none"> » Immediately control any alien plants that become newly established using registered control measures 	EPC Contractor	Construction phase Operational phase
<p>Risks from alien invasives do not only arise from invasives present within the footprint area, but also from alien invasives along the verges of the major transport routes, especially invasive grasses and smaller weeds. Similarly, invasives can be spread by construction processes to surrounding areas. To avoid the distribution of weeds and invasive plants, establish a routine amongst contractors/all staff to regularly check:</p> <ul style="list-style-type: none"> » that clothing and shoes are free of mud and seeds » radiator and grill, along wheel trims, around wheels, mud flaps, undercarriage of vehicle or other moving machinery for mud and seed 	EPC Contractor	Construction phase Operational phase

Performance Indicator	<ul style="list-style-type: none"> » Visible reduction of number and cover of alien invasive plants within the project area. » Improvement of vegetation cover from current dominance of invasive shrubs to dominance of perennial grasses and dwarf shrubs » No establishment of additional alien invasive species.
Monitoring	<ul style="list-style-type: none"> » Ongoing monitoring of area by ECO during construction. » Ongoing monitoring of area by EO/SHE representative during operation » If new infestations are noted these must be recorded. A comprehensive eradication programme with the assistance of the WfW (Working for Water) Programme is advisable.

m) OBJECTIVE: The mitigation and possible negation of the additional visual impacts associated with the construction and operation of the solar energy facility.

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future

perception of the facility. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

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

Mitigation: Action/control	Responsibility	Timeframe
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	EPC Contractor	Construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	EPC Contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	EPC Contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	EPC Contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	EPC Contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.	EPC Contractor	Throughout and at the end of the construction phase.

Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.
Monitoring	» Monitoring of vegetation clearing during construction (by

contractor as part of construction contract).

n). OBJECTIVE: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the solar energy facility will include general construction waste, hazardous waste (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. A Waste management Plan is included as **Appendix C** of this EMPr.

Project Component/s	<ul style="list-style-type: none"> » PV panels. » Power line. » Ancillary buildings. » Access roads.
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 at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	EPC Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	EPC Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
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.		
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.).	EPC Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC 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.	EPC Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly marked.	EPC Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to major waste disposal centres.	EPC 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.	EPC Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	EPC Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	EPC Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	EPC Contractor	Completion 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.	EPC Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	EPC Contractor	Duration of construction
Implement an integrated waste management approach	EPC Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate.		construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the material re-used for an appropriate purpose.	EPC Contractor	Completion of construction

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal monitoring by the EO must be undertaken to ensure 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 will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. <p>An incident reporting system will be used to record non-conformances to the EMPr.</p>

o) OBJECTIVE: Appropriate handling and storage of chemicals and hazardous substances

The construction phase will 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: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the

	<p>environment or harm to persons.</p> <p>» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.</p>
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Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an emergency preparedness plan during the construction phase.	EPC Contractor	Pre-construction and implement for duration of Contract
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation.	EPC Contractor	Construction phase
Establish an appropriate Hazardous Stores which is in accordance to the Hazardous Substance Amendment Act, No. 53 of 1992 this should include but not limited to: <ul style="list-style-type: none"> » Designated area; » All applicable safety signage; » Fire fighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and Has adequate capacity to contain 110% of the largest container contents.	EPC Contractor	Pre-construction and implement for duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	EPC Contractor	Duration of contract
All contractors must have sufficient amount of drip trays for construction vehicles, generators and temporary storage areas for small quantities of chemicals.	EPC 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.	EPC 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.	EPC Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Any hazardous spills must be removed immediately and stored in appropriate containers on an impermeable bund.	EPC Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	EPC 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.	EPC Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1.. The bunded area must be provided with a tap-off system through which spillages and leakages that might occur will be removed without any spillage outside the bunded area. Where tap-off system cannot be installed then a method statement must be provided detailing how contaminated water or spills will be removed, stored and removed from site.	EPC Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	EPC Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	EPC Contractor	Duration of contract
No chemicals must be stored or vehicle maintenance undertaken within 350m of the temporal zone of wetlands, a drainage line or hillside wetlands.	EPC Contractor	Duration of contract
Oily water from bunds at the substations must be removed from site by licensed contractors.	EPC 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.	EPC Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	EPC 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.	EPC Contractor	Duration of contract
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	EPC Contractor	
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or	EPC Contractor	

Mitigation: Action/Control	Responsibility	Timeframe
clean stormwater system.		
Upon the completion of construction, the area must be cleared of potentially polluting materials.	EPC Contractor	Completion of construction

Performance Indicator	<ul style="list-style-type: none"> » No avoidable 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"> » Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances. » 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 EMPr.

p) Minimise the impacts on fauna

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	<ul style="list-style-type: none"> » Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment. » Pipeline construction activities.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » 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.	EPC Contractor in consultation with Specialist	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.	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Permits must be applied for in order to capture, release and transport protected fauna.	EPC Contactor/ ECO	Construction
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	Construction
An animal removal plan/ rescue plan must be established to ensure the safety of animals/workers on site and effective capture and release of animals.	EPC Contractor/ ECO	Construction
Where facility perimeter fence cannot be fully enclosed, animal corridors (dugouts below the fence) must be established every 200 m in order to allow trapped animals to escape.	EPC Contractor	Construction
Traffic calming or extensive use of speed limit/ warning signs must be installed on/ along access roads to prevent/ reduce faunal mortalities.	EPC Contractor	Construction
Vehicle movements must be restricted to designated roadways.	EPC Contractor	Construction
Vehicular movements outside of designated roadways must be done with the permission of the ECO and prior inspection of newly proposed informal access road.	EPC Contractor	Construction

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 » An incident reporting system will be used to record non-conformances to the EMP.

7.3 Detailing Method Statements

a) 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 EMPr 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 plant, 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:

- » Details of the responsible person/s;
- » Construction procedures;
- » Materials and equipment to be used;
- » transportation of the equipment to and from site;
- » Handling of equipment/material within 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.
- » Signed acknowledgement from the contractor of understanding of the EMP.

Very specific areas to be addressed in the method statement: before, during and post construction includes:

- » Site Establishment plan (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- » Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure and processes.
- » Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions as applicable).
- » Stipulate the storm water management procedures recommended in the storm water management plan.
- » Ablution facilities (placement, maintenance, management and servicing).
- » Solid Waste Management:

- * Description of the waste storage facilities (on site and accumulative).
- * Placement of waste stored (on site and accumulative).
- * Management and collection of waste process.
- * Recycle, re-use and removal process and procedure.
- » Liquid waste management:
 - * The design, establish, maintain and operate suitable procedures for pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
 - * Stipulate grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) that needs to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.
- » Dust and noise pollution:
 - * Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels (construction activities generating output levels of 85 dB(A) near human settlement, are to be confined to working hours (06h00 - 18h00) Mondays to Fridays).
 - * Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- » Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
 - * List of all potentially hazardous substances to be used.
 - * Appropriate handling, storage and disposal procedures.
 - * Prevention plan of accidental contamination of soil at storage and handling areas.
 - * All storage areas, (i.e.: for harmful substances appropriately banded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (i.e.: removal to reintroduction or replanting, if necessary).
- » Rehabilitation and re-vegetation process.
- » Traffic management.

- » Incident and accident reporting protocol.
- » General administration (and stipulating that all documentation and licences must be on site at all times).
- » Designate access road and the protocol on while roads are in use.
- » Requirements of gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Eskom's Construction Manager /Project Manager, 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. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

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

a) OBJECTIVE: To 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 EMPr. 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:

- » All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
- » The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity is to have copies of the relevant Method Statements and be aware of the content thereof.

- » Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff are aware of the location and have access to the document.
- » Senior site staff will be familiar with the requirements of the EMPr 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 plant 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 an Environmental Awareness Training course.
- » The course 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.
- » All sub-contractors must have a copy of the EMPr and sign a declaration/acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
- » Contractors and main sub-contractors should have a basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

7.4.1 Environmental Awareness Training

Environmental Awareness Training must take the form of an on-site talk and demonstration by the SHE Representative/ EO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the SHE Representative/EO and verified by the ECO on site.

7.4.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should include discussing the developer's environmental policy and values, the function of the EMP and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Representative/EO on site.

7.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least once a week) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site, alternatively talks can take form of a document which must be read and understood by all construction personnel. Toolbox talks must be compiled and distributed by the EPC to all contractors. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

7.5 Monitoring Programme: Construction Phase

a) OBJECTIVE: To 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 project Developer/Owner will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/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.

7.5.1 Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the

remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

7.5.2 Monitoring Reports

A monitoring report must be compiled by the ECO on a monthly basis and must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

7.5.3 Final Audit Report

Final environmental audit reports must be compiled by the ECO and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and another within 30 days of completion of rehabilitation activities. These reports must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

MANAGEMENT PROGRAMME: REHABILITATION

CHAPTER 8

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

8.1. Objectives

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

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

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A perennial vegetation cover of at least 30%, preferably more, will be desirable.

The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

The first vegetation layer must be developed further until a desirable end state, as determined during the design phase and taking the original vegetation description as guideline, is established.

Project Component/s	<ul style="list-style-type: none"> » PV Array supports and trenching » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Potential topsoil stockpiles
Potential Impact	<ul style="list-style-type: none"> » Within the footprint, a change of plant species composition with lower productivity and agricultural potential can be expected due to removal, disturbance and continued long-term shading of vegetation » A largely reduced vegetation cover will cause the ecosystem to be more prone to erosion and irreversible degradation

	<ul style="list-style-type: none"> » Disturbance of indigenous vegetation creates opportunities for the establishment of invasive vegetation or creation of surfaces that do not support the permanent (re-) establishment of vegetation » Loss of natural regeneration potential of soils » Loss of agricultural potential of soils.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks » Excavation of foundations and trenches » Construction of site access road » Power line construction activities » PV array construction activities » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species » Prevent and accelerated erosion of ecosystem degradation

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitation of surface		
A rehabilitation and dismantling plan must be provided at least 7 days prior to the completion of construction, which must be provided to the ECO.	EPC Contractor	End of construction
Prior to the application of topsoil <ul style="list-style-type: none"> » Subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures » Ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper/ grader or by hand to a depth of 15 – 20 cm » Compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil » Any foreign objects, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place » Shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes 	EPC Contractor,	During and after construction
Application of topsoil <ul style="list-style-type: none"> » Topsoil shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed » The final prepared surface shall not be smooth but 	EPC Contractor,	During and after construction

Mitigation: Action/Control	Responsibility	Timeframe
<p>furrowed to follow the natural contours of the land</p> <ul style="list-style-type: none"> » The final prepared surface shall be free of any pollution or any kind of contamination » Care shall be taken to prevent the compaction of topsoil 		
<p>Soil stabilisation</p> <ul style="list-style-type: none"> » Mulch, if available from shredded vegetation, shall be applied by hand to achieve a layer of uniform thickness » Mulch shall be rotovated into the upper 10 cm layer of soil <ul style="list-style-type: none"> * This operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil » Measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible <ul style="list-style-type: none"> * Where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed » Additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas » Runnels or erosion channels developing shall be back-filled and restored to a proper condition <ul style="list-style-type: none"> o Such measures shall be effected immediately before erosion develops at a large scale » Where erosion cannot be remedied with available mulch or rocks, geojute or other geotextiles shall be used to curtail erosion 	EPC Contractor,	Construction phase Operational phase, followed up until desired end state is reached
Re-vegetation		
<p>In line with specifications regarding permissible biodiversity and the rehabilitation plan a minimum percentage cover of vegetation must be established and permanently maintained post construction</p>	Developer and horticultural EPC Contractor	After construction, throughout operational phase
<p>Implement re-vegetation and rehabilitation plan (refer to Appendix E).</p> <ul style="list-style-type: none"> » Re-vegetation of the final prepared area is expected to occur spontaneously to some degree where topsoil could be re-applied within 6 months » Re-vegetation will be done according to an approved planting/landscaping plan according to the desirable end states and permissible vegetation 	EPC Contractor,	Construction phase Operational phase, followed up until desired end state is reached

Mitigation: Action/Control	Responsibility	Timeframe
<p>Re-seeding</p> <ul style="list-style-type: none"> » Re-vegetation can be increased where necessary by hand- seeding indigenous species <ul style="list-style-type: none"> ○ previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools ○ commercially available seed of grass species naturally occurring on site can be used as alternative » re-seeding shall occur at the recommended time to take advantage of the growing season » in the absence of sufficient follow-up rains after seeds started germinating, irrigation of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank 	<p>EPC Contractor,</p>	<p>Construction phase Operational phase, followed up until desired end state is reached</p>
<p>Planting of species</p> <ul style="list-style-type: none"> » the composition of the final acceptable vegetation will be based on the vegetation descriptions of the original ecological EIA investigation, and will include rescued plant material » geophytic plants shall be planted in groups or as features in selected areas » during transplanting care shall be taken to limit or prevent damage to roots » plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots 	<p>EPC Contractor</p>	<p>Construction phase Operational phase, followed up until desired end state is reached</p>
<p>Traffic on re-vegetated areas</p> <ul style="list-style-type: none"> » designated tracks shall be created for pedestrian of vehicle traffic where necessary » Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed » All rehabilitated areas must be demarcated to prevent accidental disturbance from vehicles and heavy machinery. 	<p>EPC Contractor,</p>	<p>Construction phase Operational phase</p>
<p>Establishment</p> <ul style="list-style-type: none"> » The establishment and new growth of re-vegetated and replanted species shall be closely monitored <ul style="list-style-type: none"> * Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created 	<p>EPC Contractor,</p>	<p>Construction phase Operational phase, followed up until desired end state is</p>

Mitigation: Action/Control	Responsibility	Timeframe
		reached
Monitoring and follow-up treatments		
Monitor success of rehabilitation and re-vegetation and take remedial actions as needed according to the respective plan » Erosion shall be monitored at all times and measures taken as soon as detected » Where necessary, reseeded or replanting will have to be done if no acceptable plant cover has been created	ECO during construction, suitable designated person / contractor after that	Construction phase Operational phase
Weeding » It can be anticipated that invasive species and weeds will germinate on rehabilitated soils <ul style="list-style-type: none"> ○ These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate ○ Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications 	EPC Contractor	Construction phase Operational phase

Performance Indicator	<ul style="list-style-type: none"> » No activity in identified no-go areas » Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist » The structural integrity and diversity of natural plant communities is recreated or maintained » Indigenous biodiversity continually improves according to the pre-determined desirable end state <ul style="list-style-type: none"> ○ This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state » Ecosystem function of natural landscapes and their associated vegetation is improved or maintained
Monitoring	<ul style="list-style-type: none"> » Fortnightly inspections of the site by ECO during construction » An incident reporting system must record non-conformances to the EMPr. » Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established <ul style="list-style-type: none"> * These inspections should be according to the monitoring protocol set out in the rehabilitation plan » Thereafter annual inspections according to the minimal monitoring protocol

MANAGEMENT PROGRAMME: OPERATION

CHAPTER 9

Overall Goal: To ensure that the operation of the solar energy 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 solar energy facility 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.

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

9.1. Roles and Responsibilities for the Operation Phase of the Solar Energy Facility

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Operations Manager, and Environmental Manager for the operation phase of this project are detailed below.

The **Power Station Manager** will:

- » Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
- » Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
- » Take appropriate action as a result of findings and recommendations in management reviews and audits.
- » Provide forums to communicate matters regarding environmental management.

The **Technical/SHEQ Manager** will:

- » Develop and Implement an Environmental Management System (EMS) for the solar energy facility and associated infrastructure.
- » Manage and report on the facility's environmental performance.
- » Maintain a register of all known environmental impacts and manage the monitoring thereof.

- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the solar energy facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.
- » Track and control the lodging of any complaints regarding environmental matters.

The Technical/SHEQ Manager must provide fourteen (14) days written notification the DEA that the activity operational phase will commence.

9.2. Objectives

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

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

Indirect impacts on vegetation and fauna during operation could result from maintenance activities and the movement of people and vehicles on site and in the surrounding area. 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 subsequent rehabilitation at its completion. » Areas where the natural microclimate and thus vegetation composition has changed due to structures such as PV panels erected.
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. » Decrease in local faunal populations and species diversity.

Activity/Risk Source	<ul style="list-style-type: none"> » Movement of employee vehicles within and around site. » Excessive shading by PV panels. » Altered rainfall interception and resultant runoff patterns by infrastructure.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant re-growth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Owner O&M Operator	Operation
An on-going invasive and alien plant monitoring and eradication programme must be implemented, where necessary	Owner O&M Operator	Operation
In line with specifications regarding permissible biodiversity and the rehabilitation plan, a minimum percentage cover of vegetation must be established and permanently maintained post construction	Owner in consultation with Specialist	After construction, throughout operational phase
A faunal monitoring and rescue plan must be implemented to minimise death and injury and to prevent further incidents from occurring.	Owner O&M Operator	Operation
An avifaunal monitoring plan must be implement to identify and mitigate possible impacts with infrastructure.	Owner in consultation with Specialist	Operation

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts. » No disturbance of vegetation outside of project site. » No further thickening of invasive shrubs on site. » Gradual disappearance of all alien plant species on site.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by facility manager and environmental manager. » Regular inspections to monitor plant re-growth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

b) OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the Proposed Tutuka PV Project

Project Component/s	Construction site
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (within 2.5km of the site).
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility as a whole, including the panels, servitudes and the ancillary structures.	Owner O&M Operator	Throughout the operational phase.
Monitor the implementation of mitigation measures, and implement remedial action as and when required.	Owner O&M Operator	Throughout the operational phase.
Maintain roads and servitudes to forego erosion and to suppress dust.	Owner O&M Operator	Throughout the operational phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Owner O&M Operator	Throughout the operational phase.

Performance Indicator	Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.
Monitoring	Monitoring of the entire site on an ongoing basis (by operator).

c) OBJECTIVE: Minimise soil degradation and erosion (Erosion Management Plan)

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.

Management of erosion will be required during the operation phase of the facility. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the principles of Erosion Management plan included in this report.

Project Component/s	<ul style="list-style-type: none"> » PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Soil 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"> » Poor rehabilitation and/or re-vegetation of cleared areas. » 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"> » Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion and deposition of soil into drainage lines. » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Owner O&M Operator	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).	Owner O&M Operator	Operation
Develop and implement an appropriate stormwater management plan for the operational phase of the facility	Owner O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » Acceptable level of soil erosion around site, as determined by the environmental manager. » Acceptable level of increased siltation in drainage lines, as determined by the environmental manager.
Monitoring	» Inspections of site on a bi-annual basis by the ECO

d) 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.	Owner O&M Operator	Operation
Appropriate dust suppressant must be applied to the roads as required to minimise/control airborne dust.	Owner O&M Operator	Duration of contract
Speed of vehicles must be restricted, as defined by the Environmental Manager.	Owner O&M Operator	Duration of contract
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Owner O&M Operator	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 EMPr.

e) OBJECTIVE: Ensure the implementation of an appropriate fire management plan during the operation phase

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Operation and maintenance of the solar energy facility and associated infrastructure.
Potential Impact	» Veld fires can pose a safety risk to the power station, 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 solar energy facility 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
Join the local Fire Protection Agency.	Owner O&M Operator	Operation
Provide adequate fire fighting equipment on site.	Owner O&M Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Owner O&M Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Owner O&M Operator	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.).	Owner O&M Operator	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.	Owner O&M Operator	Operation
Contact details of emergency services should be prominently displayed on site.	Owner O&M Operator	Operation

Performance Indicator	» Fire fighting equipment and training provided before the operational phase commences. » Appropriate fire breaks in place and maintained.
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Monitoring	» The project developer must monitor indicators listed above to ensure that they have been met.
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f) OBJECTIVE: Maximise local employment and business opportunities associated with the operational phase

The facility is expected to be operational for more than 20 – 25 years during which time approximately ~50 staff members are expected to be required on-site. Therefore, long-term direct job opportunities for locals could exist, although limited. However, in an area with such high unemployment figures, these limited opportunities can still be seen as a positive impact on the quality of life of those benefiting from the employment.

Some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. These opportunities for local service providers to render services to the proposed facility could include maintenance of the guardhouse, gardening at the guardhouse, cleaning services, security services and maintenance or replacement of general equipment

Project Component/s	» Day to day operational activities associated with the PV facility, including maintenance etc.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised
Activities/Risk Sources	» The operational phase of the PV facility will create approximately 50 full time employment opportunities.
Mitigation: Target/Objective	» In the medium to long term employ as many locals as possible to fill the full time employment opportunities.

Mitigation: Action/Control	Responsibility	Timeframe
Adopt a local employment policy to maximise the opportunities made available to the local labour force.	Owner O&M Operator	Prior to commencement of operation
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible		
Establish vocational training programs for the local labour force to promote the development of skills	Owner O&M Operator	Prior to commencement of operation

Performance Indicator	» Percentage of workers that were employed from local communities .
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	» Number of people attending vocational training throughout the operation phase
Monitoring	» The project developer must monitor indicators listed above to ensure that they have been met for the operational phase.

g) 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	» Substation. » Operation and maintenance staff. » Workshop.
Potential Impact	» 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	» Transformers and switchgear for the substations. » Ancillary buildings.
Mitigation: Target/Objective	» 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.

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 hazardous stores area.	Owner O&M Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	Owner O&M Operator	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 Operator	Operation
Care must be taken to ensure that spillage of oils and	O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
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.		and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	O&M Operator	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Operator/ waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	O O&M perator/ waste management contractor	Operation
Used oils and chemicals: » 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 Operator	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	O&M Operator	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	O&M Operator	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Operator	Operation
On-site hazardous waste storage must not exceed the design limits as calculated from the relevant regulations and SANS codes.	Owner	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 operations manager
- » All appropriate waste disposal certificates must be maintained

MANAGEMENT PROGRAMME: DECOMMISSIONING

CHAPTER 10

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of 20 - 25 years (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

10.1. 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.

10.2 Disassemble and Remove Infrastructure

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

10.3 Objectives

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which may require this section of the EMPr to be revisited and amended.

a) OBJECTIVE: To avoid and or minimise the potential social impacts associated with the decommissioning phase

Project Component/s	» Decommissioning phase of the PV facility and associated infrastructure
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, stress, depression etc. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/Risk Source	» Decommissioning of the PV facility
Mitigation: Target/Objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV facility.

Mitigation: Action/control	Responsibility	Timeframe
Retrenchments should comply with South African Labour legislation of the day	Owner	At decommissioning
Undertake activities as prescribed by the legislation at the time of decommissioning and comply with all legal requirements administered by the competent authority at the time.	Owner	At decommissioning

Performance Indicator	» South African Labour legislation relevant at the time
Monitoring	» No occurrences of dismissals not in-line with South African Labour Legislation.

b) OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the Proposed Tutuka Solar PV Energy Facility

Project Component/s	The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, substation, workshop, transformer, and power line).
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.
Mitigation: Target/Objective	Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas.

Mitigation: Action/control	Responsibility	Timeframe
Remove infrastructure not required for the post-decommissioning use of the site.	Owner O&M Operator	During the decommissioning phase.
Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into	Owner O&M Operator	During the decommissioning phase.

Mitigation: Action/control	Responsibility	Timeframe
rehabilitation specifications.		
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Owner O&M Operator	Post decommissioning.

Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.
Monitoring	Monitoring of rehabilitated areas quarterly for at least a year following decommissioning.

c) OBJECTIVE: Minimise potential impacts on the environment during decommissioning activities

Project Component/s	» Decommissioning phase of the PV facility and associated infrastructure
Potential Impact	» Decommissioning may result in loss of newly established common and endemic plant species. » Established faunal habitats may be destroyed from decommissioning activities.
Activity/Risk Source	» Decommissioning of the PV facility
Mitigation: Target/Objective	» To avoid and or minimise the potential impacts on the receiving environment during decommissioning of the Tutuka PV facility,

Mitigation: Action/control	Responsibility	Timeframe
Appoint a specialist to identify sensitive ecological areas and protected species which must be protected during decommissioning activities.	Owner	At decommissioning
Appoint an EO to monitor activities throughout the decommissioning phase of the project in order to ensure protection of sensitive areas/ species.	Owner	At decommissioning
Ensure that decommissioning activities comply with the relevant environmental legislation	Owner	At decommissioning
Disturbed areas are to follow the rehabilitation plan to ensure successful regrowth of endemic species.	Owner	At decommissioning

Performance Indicator	» Minimal loss of fauna and flora » Identification of pioneer species in the previously disturbed areas.
Monitoring	» Monitoring of disturbed areas until complete re-growth

**PPENDIX A:
FINAL LAYOUT AND SENSITIVITY
MAPS**

**APPENDIX B:
GRIEVANCE MECHANISM FOR
PUBLIC COMPLAINTS AND ISSUES**

**APPENDIX C:
WASTE MANAGEMENT PLAN**

**APPENDIX D:
ALIEN INVASIVE MANAGEMENT
PLAN**

**APPENDIX E:
RE-VEGETATION AND
REHABILITATION PLAN**

**APPENDIX F:
PLANT PROTECTION AND RESCUE
PLAN**

**APPENDIX G:
TRAFFIC MANAGEMENT PLAN**

**APPENDIX H:
STORM WATER MANAGEMENT PLAN**

**APPENDIX I:
EROSION MANAGEMENT PLAN**

**APPENDIX J:
EMERGENCY RESPONSE PLAN**