PROPOSED MERAPI PHOTOVOLTAIC (PV) SOLAR ENERGY FACILITY PHASE 3, FREE STATE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the Final Environmental Impact Assessment Report

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

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

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

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

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

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

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA Environmental Assessment 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 on-going maintenance after implementation.

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

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

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

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

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.

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.

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PROJECT DETAILS *CHAPTER 1*

SolaireDirect Southern Africa (Pty) Ltd proposes to establish a commercial solar park with associated infrastructure on Portion 0 of Farm 311 Ceylon, Portion 0 of Farm 566 Moedersgift, Portion 0 of Farm 374 Concordia, and Portion 1 of Farm 1547 De Hoop which falls within the Mantsopa Local Municipality of the Free State Province. The proposed site lies approximately south-east of Excelsior in the Free State Province. The proposed solar park and associated infrastructure (i.e. the development footprint) would be constructed over an area of approximately 250 hectares (ha) in extent and would have a generating capacity of 130MW (155 MW installed capacity). The larger project development site covers an area of approximately 1505 ha. **Figure 1.1** indicates the farm portions that are currently being assessed as part of this Environmental Impact Assessment (EIA) (farm portion shown in blue).

The proposed solar park is to be developed in 4 phases. As each phase of the project will be constructed and operated by a separate Special Purpose Vehicle (SPV), separate Environmental Authorisations will be required to be obtained for each phase. As such, each project has been registered with the National DEA under following project names and EIA reference numbers:

» Merapi Solar PV Facility - Phase 1 (DEA Ref. No 14/12/16/3/3/2/361)
» Merapi Solar PV Facility - Phase 2 (DEA Ref. No 14/12/16/3/3/2/362)
» Merapi Solar PV Facility - Phase 3 (DEA Ref. No 14/12/16/3/3/2/363)
» Merapi Solar PV Facility - Phase 4 (DEA Ref. No 14/12/16/3/3/2/364)

The purpose of the proposed facility is to sell the electricity generated to Eskom as part of the Renewable Energy Independent Power Producers (IPP) Procurement Programme. The IPP Procurement Programme has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities by IPPs. Selling of electricity according to the IPP Procurement Programme has the advantage of giving developers long-term stability and predictability, as well as providing the opportunity for the South African Government to introduce renewable energy into the power generation technology mix within the country.

This EMP has been compiled for the Merapi Solar Facility – Phase 3, which is proposed to comprise the following components:

Component	Description
Location of the site	~ 5 km south-east of Bloemfontein
Municipal Jurisdiction	Mantsopa Local Municipality; Motheo District Municipality
Extent of the proposed development footprint (four phases)	~85 ha
Extent of broader site available for development	~1505 ha
Site access	The site can be accessed easily via the R709 main road which crosses through the proposed sites, as well as via farm gravel roads. The farm roads will be upgraded and used to access the facility site during construction and operation.
Generating capacity(four phases)	55 MW
Proposed technology	Photovoltaic panels
Associated infrastructure	» An on-site substation and 22kV/132kV overhead power line to facilitate the connection between the solar energy facility and the Eskom electricity grid. » Internal access roads (~4m wide x 50-1000m in length) » Guard house » Laydown, campsite and assembly area. » Office and Control centre.
Water use	» ~3 million litres/year required during the construction phase and 550,000 litres/year for operations, » Water requirements for the construction phase of the PV power facility will be supplied by the Local Water Users' Association. Alternatively water will be provided via a rainwater tank. » No effluent will be produced except for the normal sewage from site and operations staff. This will be treated as per normal standards with a septic tank and disposed of at an appropriate licensed facility off-site.

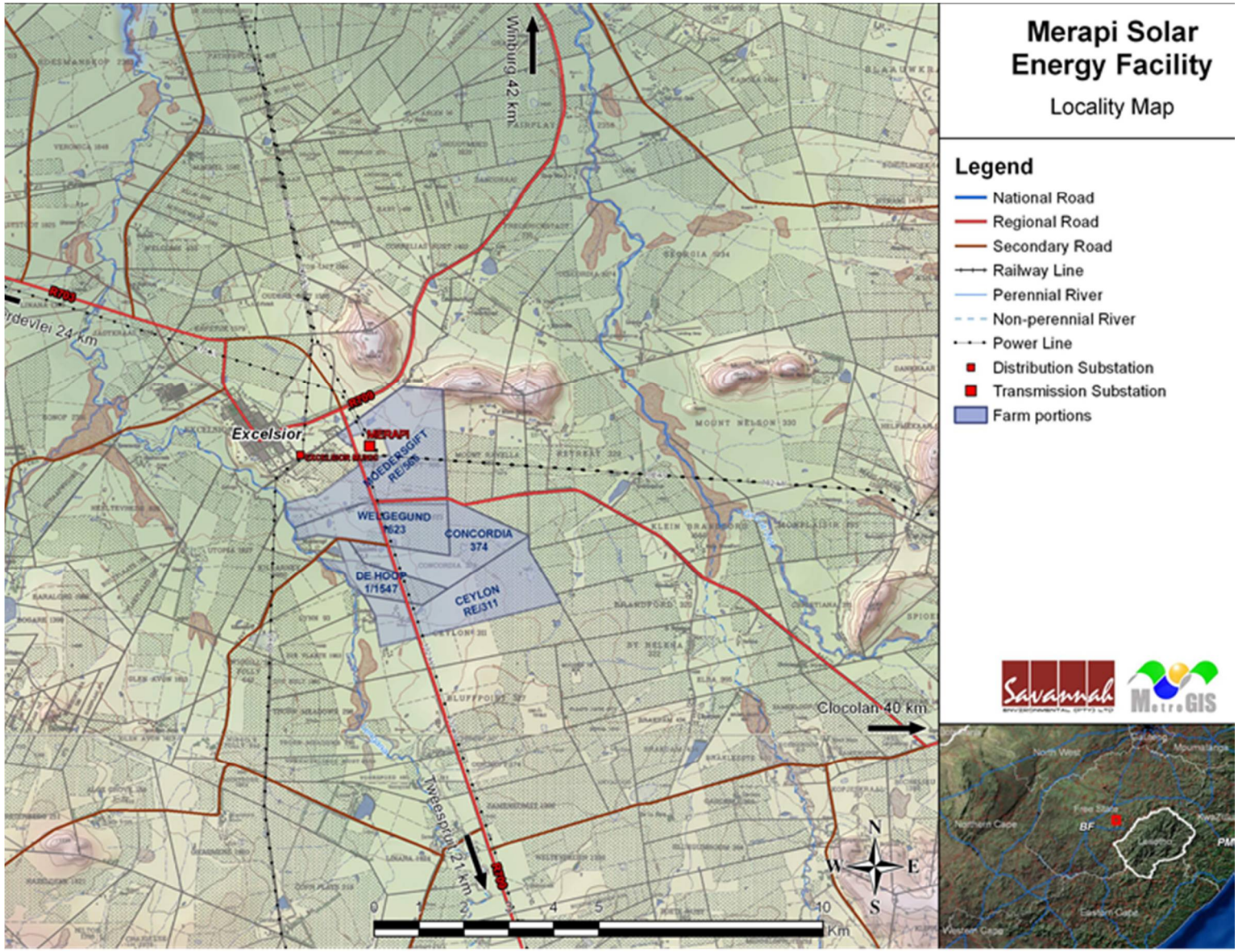

Figure 1.1: Locality map

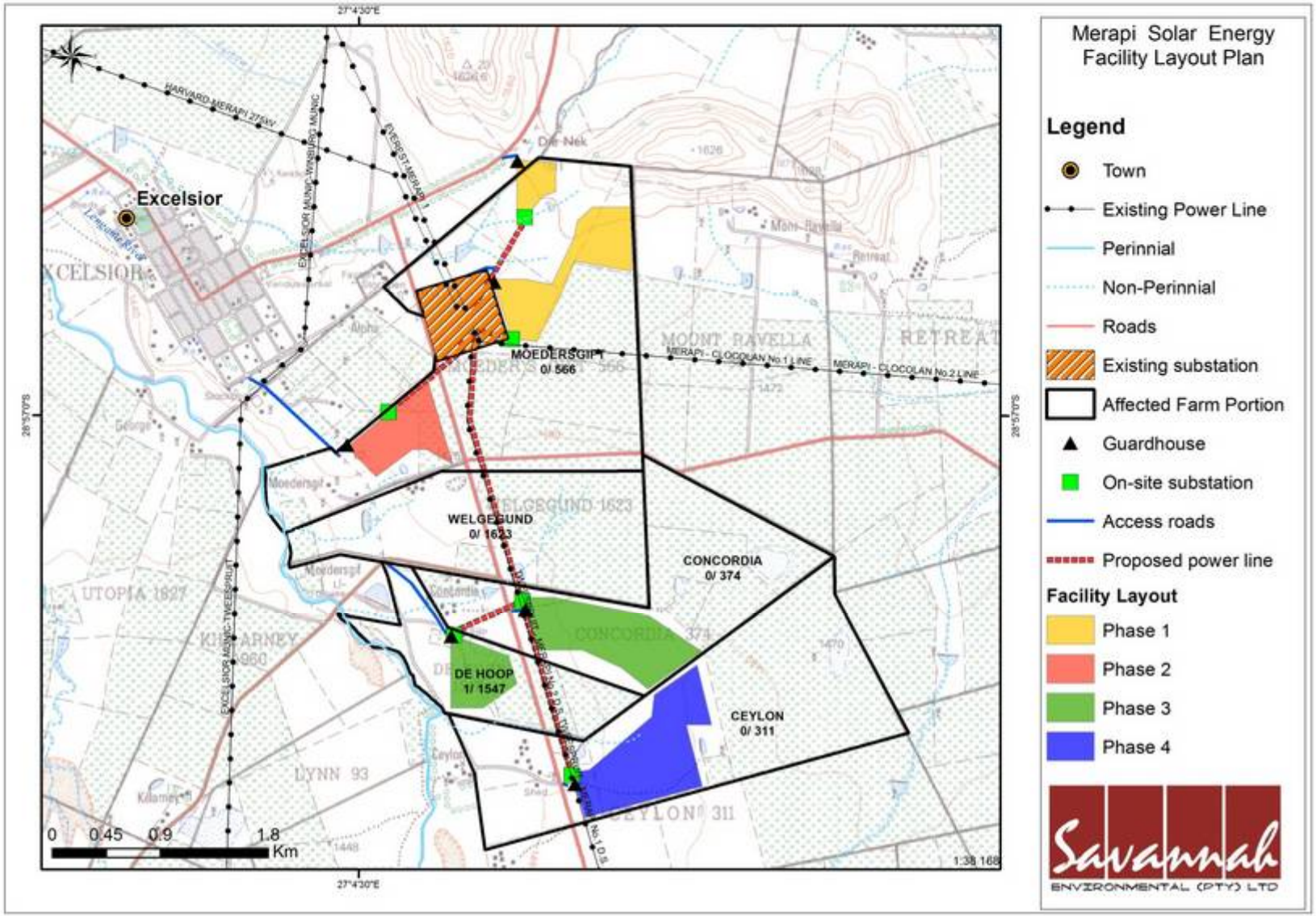

Figure 1.2: Facility Layout Plan showing the 4 phases of the proposed Merapi Solar Park as well as associated infrastructure.

1.1. Activities and Components associated with the Solar Energy Facility

The main activities/components associated with the proposed facility are detailed below.

Construction Phase:

The construction phase is expected to extend over a period of 18-24 months and create approximately 291 employment opportunities at peak construction. It is anticipated that approximately 60% (175) of the employment opportunities will be available to low skilled (construction labourers, security staff etc.), 15% (43) semi-skilled workers (drivers, equipment operators etc.) and 25% (73) to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area, specifically residents from the town of Excelsior, Winburg, Ladybrand and Bloemfontein. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities.

Typically the construction will operate as a 'follow the leader' where the groundworks will be prepared followed by the erection of mounting structures and then followed by the attachment of the solar panels and the integration of the electrical equipment. The following construction activities are expected to form part of the project's scope of works.

Table 1.1: Activities associated with the construction of a PV facility

Activity	Description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: » *Geotechnical survey* – 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. » *Site survey* – 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 issued for the facility. » *Power line servitude survey* – once the placement of the towers for the power line has been finalised, a walk through survey will be undertaken for ecological, archaeology and heritage resources which may necessitate certain towers to be moved to avoid sensitivities.
Establishment of access roads	» The project development site is accessible easily via the R709 main road which crosses through the proposed sites and gravel farm roads. The farm roads will be upgraded and used to access the facility site. » A safety firebreak band and roadway will be constructed around the perimeter of the site in order to prevent the spread of external fires entering the park and accommodate light service and maintenance vehicles. On the same principle, road design will be determined within detailed engineering in accordance with SABS standards and South African requirements (e.g. compacted road layer works and crushed stone surfacing).
Undertake site preparation	» Site preparation activities will include clearance of vegetation at the footprint of the area infrastructure (i.e. PV panels, substation, ancillary buildings) and linear components (i.e. power line, internal access roads). These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.
Transport of components and equipment to site	» The components for the proposed facility will be transported to site, in sections, by road. Some of the components for the power generation block 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

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

Activity	Description
	power line. » In some instances, the dimensional requirements of the loads to be transported during the construction phase (e.g. 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.
Establishment of construction camps, workshops, and temporary laydown areas	» 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 approximately 5000m² 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.
Establishment of PV panels	» Photovoltaic panel: A group of modules fastened together, pre-assembled and wired, designed to serve as an installable unit in a photovoltaic array. » Photovoltaic module: The smallest complete environmentally protected assembly of interconnected photovoltaic cells. This 'module' is then typically mounted in an aluminium frame. » Mounting structure: With the rapid growth of grid-connected distributed systems, a wide range of products have been developed for installing PV modules. Panels would be attached to steel screw piles of approximately 1500 mm long. » Ready mix cement will be used to stabilise the foundation. Ready-mix cement will be prepared off-site and transported from the closest centre to the development. This however, does not rule out the possibility of onsite batching. » A service cage will be erected around the foundation unit to allow for the establishment of the electrical and hydraulic infrastructure). This includes the inverter. » A drive head will be positioned on top of the foundation unit as a connection point for the PV panel which allows for the dual axis tracking. » Trenches- Cabling sleeves shall be installed as part of the Civil Works. Trenches will be in accordance with SABS standards. » Foundation/Anchoring- Screw or ram pile will be used provided soil conditions allow such solution. Alternatively concrete ballast foundations will be used.

Activity	Description
Establishment of substation and power line	» Ancillary infrastructure includes an overhead power line feeding into the Eskom electricity connecting into the existing substation, workshop, storage areas as well as a temporary contractor's equipment camp. » 22kV/132kV overhead power line will be constructed from the on-site substation on each phase to connect directly to the existing substation situated north-west of the study site. The proposed power lines range between ~50-1000m in length for each. The following route is proposed: from the each facility the power line will follow a route (ie. 50-1000m) on the northern side of the project site to connect to the existing substation. Note that the final grid connection will ultimately depend on Eskom. » The establishment of the above ancillary infrastructure will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.
Undertake site rehabilitation	» Once construction is complete and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site that are not required during the operational phase must be closed and prepared for rehabilitation.

Operation and Maintenance Phase:

It is anticipated that each phase will create ~ 60 permanent employment opportunities, of this total ~ 30 (50%) will be low skilled (security and maintenance), 10 (17%) semi-skilled and 20 (33%) skilled employees. As indicated above, due the proximity of the site to Excelsior, Winburg, Ladybrand and Bloemfontein, the majority of the work opportunities associated with the operational phase are likely to be taken up by members from the local community. It is expected 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 (using water and/or pressurised air).

The operational phase is expected to extend for a period of approximately 20 years with plant maintenance, depending on the energy requirements of the country. 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 (using pressurised air) 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.

Activity	Description
Operation of the PV panels and the associated electrical infrastructure	» The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). » The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). » The transformers will change the power to alternating current, where after the electricity will be conveyed to the switchgear, the underground cables and then to the existing Excelsior Substation.
Site operation and maintenance	» 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.

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 removal of the individual components. The following decommissioning activities will form part of the project scope.

Activity	Description
Site preparation	Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. 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.

1.2. Findings of the Environmental Impact Assessment Process

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws which were identified to be associated with the site, although some areas of sensitivity were identified (refer to Figure 1.3). No-go areas identified include areas of high ecological sensitivity (small rocky outcrops, ridges, footslopes of larger mountains and riparian areas).

The most significant environmental impacts associated with the proposed project include:

Ecology Impacts

» The overall impact on ecology is likely to be of **medium significance**.
» The proposed photovoltaic facility development on the site may have significant impacts on the ecology of the site and lower-lying wetlands, if mitigation measures are not strictly adhered to.
» Potentially significant negative impacts on the ecological environment would be soil degradation issues (erosion, depletion of nutrients) as a result of construction activity and the operation of the facility, possible introduction of alien invasive plants and a long-term (more than 8 months) low or absent vegetation cover after construction.
» A loss of niches and specialised habitats for flora and fauna could occur with the removal or significant degradation of large expanses of vegetation or the alteration of rocky habitats. With the ecologically justifiable placement of the different components of the proposed development, coupled with diligent implementation of mitigating measures by the developer, contractors, and operational staff, the severity of impacts can be greatly reduced.
» The impact on fauna is expected to be negligent. Currently minimal presence of wild animals could be detected, possibly due to current land use patterns. Animals that may be present are mobile and will move away during construction, possibly resettling after construction. No restricted or specific habitat of vertebrates will be affected by the proposed development; especially if the proposed development remains outside the more sensitive areas.
» The proposed Merapi Solar Facility - Phase 3 is located largely within an area of low ecological sensitivity. An area classified as being of Medium-High sensitivity is located in close proximity to a portion of this proposed development. Appropriate mitigation is required to be implemented in order to minimise impacts on this area.

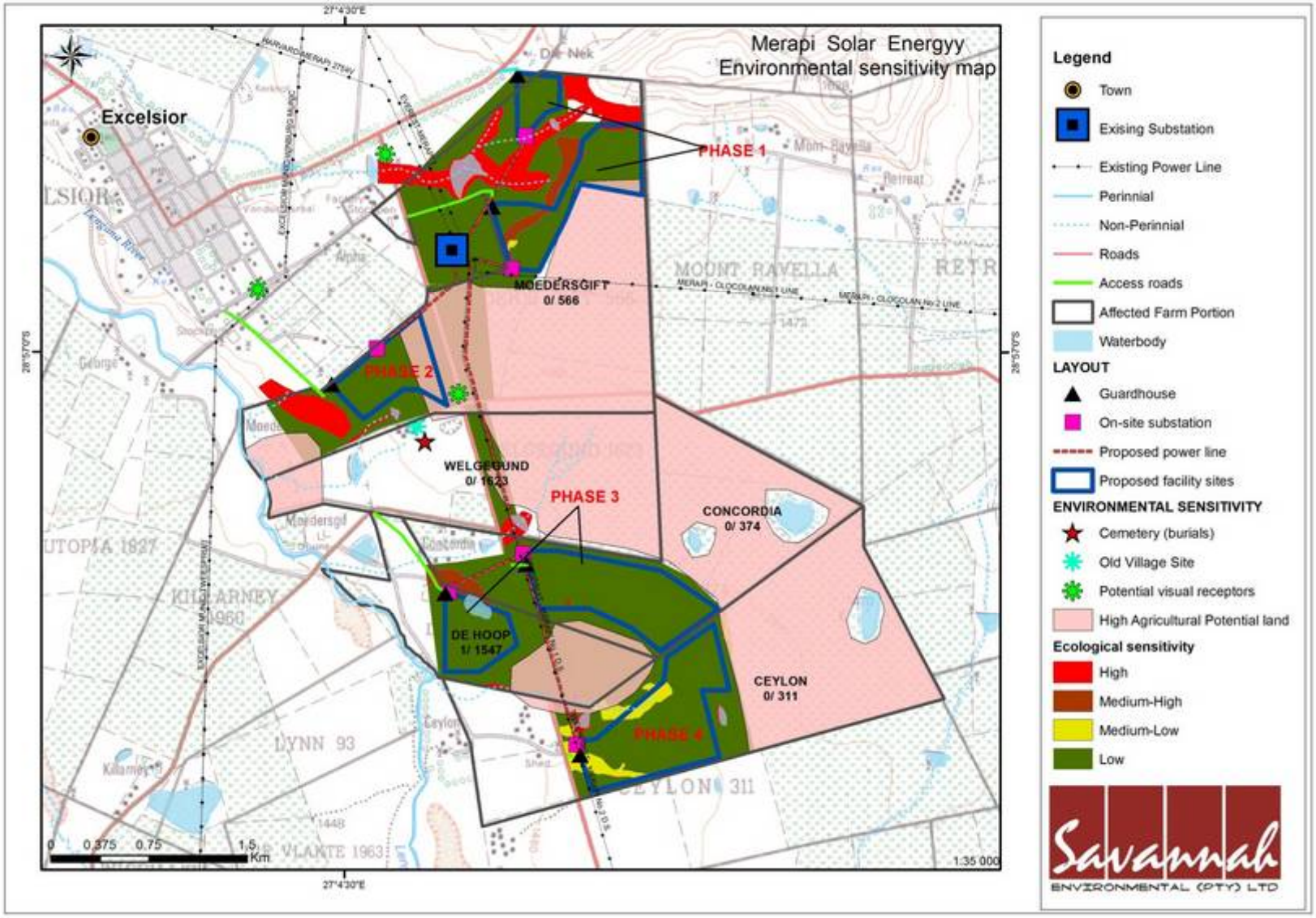

Figure 1.3: Sensitivity map for the Merapi SEF showing the proposed layout in relation to identified environmentally sensitive areas

» Significant impacts on terrestrial vertebrates are not anticipated, if developments are kept within the recommended areas.
» The proposed facility is considered to be acceptable from an ecological perspective provided appropriate mitigation and management measures are implemented throughout the lifecycle of the project.

Impacts on Soil & Agricultural Impact Assessment

» The results of the Soil and Agricultural Potential Impact Assessment for the proposed Merapi Solar Park find the proposed activity will have a **low-medium impact** on the immediate and surrounding soil systems and on agricultural potential.
» The current land use includes 235ha natural veld, 16ha ploughed land and 17ha plantation. The land capability includes 16ha arable (5% of the total development area), 235ha grazing and 17ha wilderness.
» The proposed Merapi Solar Facility - Phase 3 avoids currently cultivated areas.
» No evidence of soil erosion was observed on any of the soils during the investigation. Implementation and management of proposed mitigation measures will minimise loss of topsoil, prevent contamination of topsoil and stockpiled soil and prevent overall soil erosion.
» Renewable energy projects contribute to clean energy generation as a sustainable resource and holds huge benefits for the local region and the country as a whole.
» It is recommended that the proposed project be approved subject to the mitigation measures stipulated in the Impact Assessment and Environmental Management Programme.

Heritage & Paleontological impacts

» The overall heritage impact is of low-negligible significance with the implementation of mitigation measures.
» Five heritage sites were identified near the site (i.e. more than 200m away) and are referred to as: Merap-1, 2, 3, 4 and Merap-5.
» From an archaeological perspective, the only sign of sites of heritage potential were outside the study area.
» The proposed Merapi Solar facility – Phase 3 will not impact on any heritage sites recorded in the study area.
» No mitigation measures are proposed for these sites since they fall outside the development footprint. However, it is advised that the developer avoid these sites as far as possible.
» The proposed project construction phase should pay special attention to previously un-observed resources or "chance-finds" – these are resources that may be unearthed by the construction excavation activities.

» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner such that an investigation and evaluation of the finds can be made.

Visual Impacts

» The results of the Visual Impact Assessment for the proposed Merapi Solar Facility – Phase 3 found that the proposed activity will have a medium impact from Key Observer Points identified in the *foreground* and *middle ground*(<3km).
» Cumulative impacts are associated with the other phases of the Merapi Solar Park as well as the existing Merapi Substation and overhead power lines.
» It is herewith recommended that the proposed activity be approved subject to the mitigation measures described in Environmental Management Programme.
» It is furthermore recommended that the proposed project phases be relocated to the south-eastern portions of the subject property (eastern portions of Farms Concordia and Ceylon). The northern phases of the project on the Farm Moedersgift No. 566 presents the area's most visually prominent. A relocation of this particular phase to an area further away from the receptors in Excelsior would benefit the project from a visual perspective. In addition, it is proposed that the project phases that front onto movement corridors be set back at least 200m from the latter roads in order to establish a proper buffer between the observer and the observed view.

Impacts on the Social Environment

» The findings of the SIA indicate that the development of the proposed Merapi Solar facility - Phase 3 will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust funded by revenue generated from the sale of energy from the proposed facility also creates an opportunity to support local economic development in the area. This represents a social benefit for an area where there are limited opportunities.
» The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
» The establishment of Phase 3 (55MW) of the proposed Merapi solar park is therefore supported by the findings of the SIA.

Cumulative impacts

The Free State Province is earmarked as a potential solar energy hub for South Africa, considering the vast amounts land available. There are four proposed solar energy facilities proposed in the Motheo District Municipality, the majority of which are located near to the capital city (Bloemfontein). The Merapi Solar Facility – Phase 3 is located ~ 80 km north-east from the proposed Sannaspos Solar Park and ~ 60 km east of the proposed Glen Thorne PV facility. There is therefore sufficient distance between these proposed facilities to result in no cumulative impacts. However, the proximity of the proposed Merapi Solar Facility Phases 1, 2 and 4 to the Merapi Solar Facility Phase 3 result in the potential for localised cumulative impacts (refer to Figure 1.4). Potential cumulative impacts relate to the visual impact, impact on flora and fauna, impact on agricultural potential and impact on the social environment. No impacts on heritage sites are expected as no sites were recorded within the development footprint of any of the proposed phases.

1.3. Benefits of the Proposed Project

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a target for renewable energy of 17 GW all new installed generating capacity (new build) being derived from renewable energy forms, to be produced mainly from biomass, wind, solar and small-scale hydro.

Through pre-feasibility assessments and research, the viability of establishing a Solar energy facility near Excelsior in the Free State Province has been established by **SolaireDirect Southern Africa (Pty) Ltd.** The positive implications of establishing a solar energy facility on the demarcated sites within the Free State include:

» The project would assist the South African government in reaching their set targets for renewable energy.
» The potential to harness and utilise good solar energy resources would be realised.
» The consolidation of solar facility infrastructure within an area (specifically considering the proximity to the other solar facilities to be developed).
» The National electricity grid in the Free State would benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Positive impacts on the tourism economy of the area.
» Creation of local employment and business opportunities for the area.

The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity to the South African power grid. This generation of renewable power will aid in reducing the dependency on other power generation fuels and enhancing the reliability of the regional energy supply.

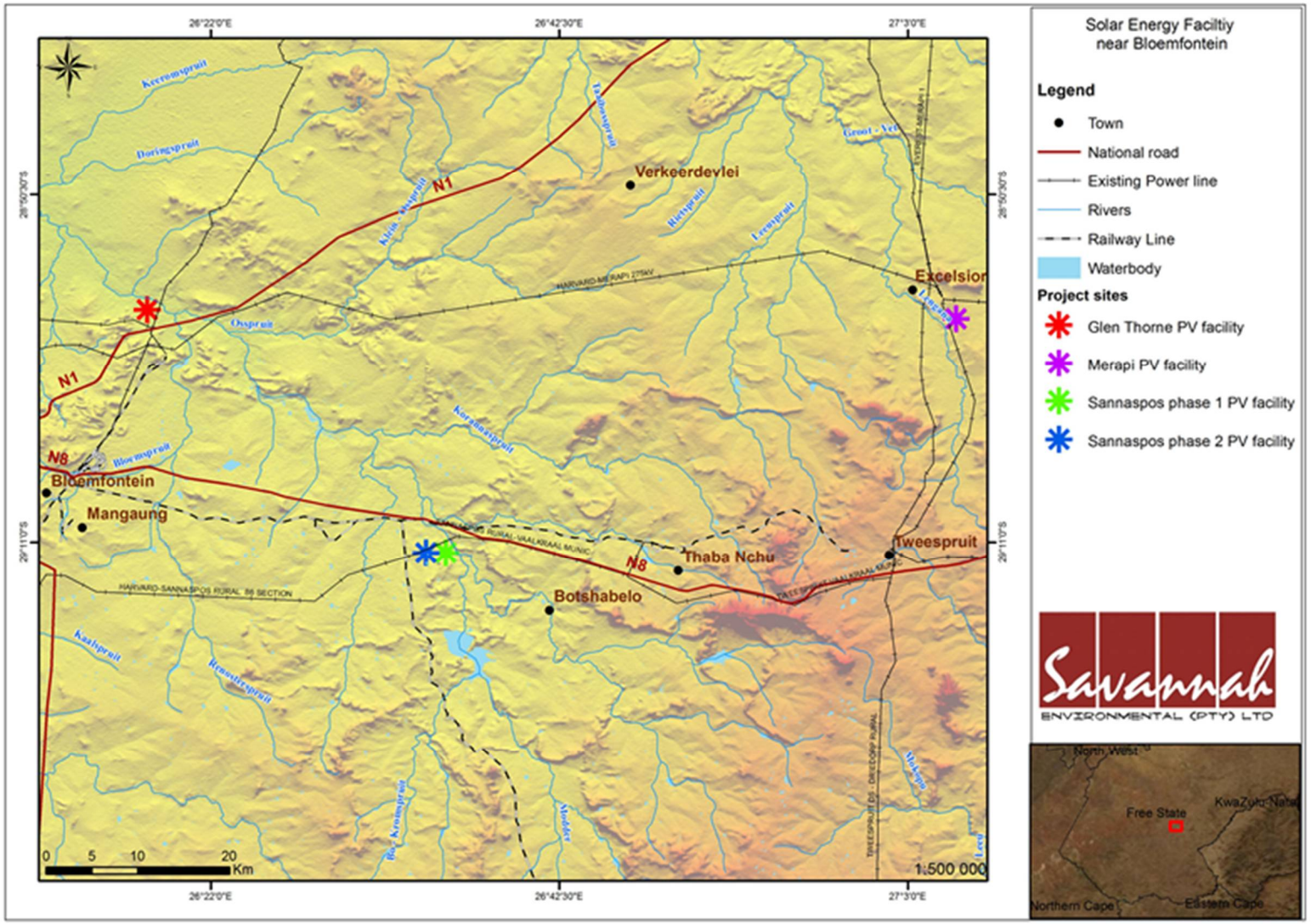

Figure 1.4: Locality map showing the Solar Energy Facility proposed in close proximity to the Merapi Solar Energy Facility

PURPOSE AND OBJECTIVES OF THE EMP CHAPTER 2

An Environmental Management Programme (EMP) 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."[2] The objective of this EMP is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMP is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

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

[2] Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

- 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 Environmental Assessment process.

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

SolaireDirect Southern Africa (Pty) Ltd 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 EMP and through its integration into the contract documentation. Since this EMP is part of the Environmental Impact Assessment process for the proposed Merapi Solar Energy Facility – Phase 3, it is important that this document be read in conjunction with the Final Environmental Impact Assessment Report compiled for this project (Savannah Environmental, February 2013). This will contextualise the EMP 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 EMP and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMP, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMP.

This EMP 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 will be adhered to, updated as relevant throughout the project life cycle.

STRUCTURE OF THIS EMP *CHAPTER 3*

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

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

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

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

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

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

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMP.

Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

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

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

3.1. Project Team

This draft EMP was compiled by:

	Name	Company
EMP Compilers:	Sheila Muniongo – Environmental Assessment Practitioner (EAP) Jo-Anne Thomas – Principle EAP	Savannah Environmental
Specialists:	Marianne Strohbach	Savannah Environmental
	Chris Viljoen	Viljoen & Associates
	Nkosinathi Tomose	Zone Land Solutions
	Jacques Louis Volschenk	Zone Land Solutions
	Job M. Kibii	Wits University Institute for Human Evolution

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

Curricula vitae for the Project team are included in **Appendix A**.

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

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

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010).
- Guidelines published in terms of the NEMA Environmental Impact Assessment 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 Environmental Impact Assessment Process (DEA, 2010).
  - Integrated Environmental Management Information Series (published by DEA).
- International guidelines, including the Equator Principles.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the Environmental Impact Assessment Report. A review of legislative requirements applicable to the proposed project is provided in Table 4.1.

Table 4.1: Relevant legislative and permitting requirements applicable to the establishment of the proposed Merapi Solar Energy Facility

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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			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 Free State Department of Economic Development, Tourism and Environmental Affairs (FS DETEA) commenting authority	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories	Department of Water Affairs	A water use license (WUL) is required to be obtained

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required). Consumptive water uses may include the taking of water from a water resource - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i.	Provincial Department of Water Affairs	if wetlands or drainage lines are impacted on, or if infrastructure lies within 500m of such features. Pans occur on the project site, but outside of the development footprint. Should water be abstracted from ground water/ a borehole on site for use within the facility, a water use license may be required.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act. S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained. A Section 53 application will be submitted the Free State DMR office.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	activities do not sterilise a mineral resources that might occur on site.		
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32) – no regulations promulgated yet. Measures to control noise (S34) - no regulations promulgated yet.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA	South African Heritage Resources Agency	An HIA and PIA has been undertaken as part of the Environmental Impact Assessment Process to identify heritage sites.(See Appendix F)

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	for the presentation of archaeological sites as part of tourism attraction (S44).		
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 January 2011). » This Act also regulates alien and invader species.	Department of Environmental Affairs	As the applicant will not carry out any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard. Specialist flora and fauna studies have been undertaken as part of the Environmental Impact Assessment Process (refer to Appendix E). As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).	Department of Agriculture	This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas.
National Forests Act (Act No. 84 of 1998)	According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by	National Department of Forestry	There are no protected trees in the study area.

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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. S (2 - 4) provides general principles for land development and conflict resolution.	Local Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	Department of Agriculture	Subdivision will have to be in place prior to any subdivision approval in terms of S24 and S17 of the Act.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list.	National Department of Water and Environmental Affairs Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 718), an Environmental Impact Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		undertaken in accordance with the requirements of the Act, as detailed in the EMP (refer to Appendix K). The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» 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.		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).
Promotion of Access to Information Act (Act No 2 of 2000)	All requests for access to information held by state or private body are provided for in the Act under S11.	Department of Environmental Affairs	No permitting or licensing requirements.
Promotion of Administrative Justice Act (Act No 3 of 2000)	In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. Interested and affected parties have a right to be heard.	Department of Environmental Affairs	No permitting or licensing requirements.
Provincial Legislation			
The Free State Nature Conservation Bill 23 of 2010 (FSNCB)	According to this Bill- Chapter 10, Section 31: Except on authority of a permit issued by the MEC or under environmental authorisation no person may – Drain or mechanically disturb any wetland or portion thereof utilise a wetland or portion thereof in a manner that would damage the hydrological or ecological	Provincial Department of Environmental Affairs	Permitting or licensing requirements arise from this legislation for the proposed activities to be undertaken for the proposed project as there are protected succulent

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	function thereof engage in activities outside but adjacent to the wetland which would damage the hydrological or ecological functioning of such wetland. Chapter 10, Section 32: No person may undertake any activity involving any species of wild animal or plant which causes or has the potential to cause a degradation in the natural state of the indigenous biodiversity of that area » The Act provides lists of protected species for the Province		and bulb plant species on the proposed development site. A permit is required to remove these plants.

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

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

» Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
» Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the linear components, including the access roads and power line alignments.
» Enables the 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.

5.1 Objectives

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

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

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

The implementation of the EMP within this area will minimise and/or mitigate impacts on the environment, specifically on the ecology of the project area.

Areas of high sensitivity include rocky outcrops, ridges, and small koppies which are a habitat for several protected species found near the sites. Once these habitats have been physically altered, they cannot be recreated or returned to their former diversity and functionality therefore should be treated as no-go areas. Other sensitive ecological areas include dense vegetation of the riparian areas fringing the drainage channels which is essential in keeping the drainage channel intact and protects it from erosion as well as footslopes of larger mountains and riparian areas. These areas should be avoided as far as possible, and where not possible to avoid, impacts on such sites should be minimised to reduce impacts to acceptable levels.

Project Component/s	» PV panels. » Substation. » Access roads. » Power line.
Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all the facilities components.
Mitigation: Target/Objective	» The design of the facility responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Appoint qualified botanical and faunal specialists and ornithologist to ground-truth all power line infrastructure footprints. Their recommendations must inform the final layout.	SolaireDirect Southern Africa (Pty) Ltd / specialists	Design stage
Undertake a geotechnical pre-construction survey.	Geotechnical specialist	Design
Obtain any additional environmental permits required (e.g. water use license, permit to impact on protected plant species) prior to the commencement of construction.	SolaireDirect Southern Africa (Pty) Ltd	Project planning
Avoid identified sensitive areas within the site in the final design of the facility.	Engineering design consultant and SolaireDirect Southern Africa (Pty) Ltd	Design review
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the Environmental Impact Assessment Report and relevant appendices.	Engineering design consultant, solar component supplier, and SolaireDirect	Design review

Mitigation: Action/Control	Responsibility	Timeframe
	Southern Africa (Pty) Ltd	
External access point and internal access road to be carefully planned to maximise road user safety.	SolaireDirect Southern Africa (Pty) Ltd	Design
Compile a comprehensive storm water management plan for hard surfaces as part of the final design of the project (refer to Appendix C for principles to be considered). This must include appropriate means for the handling of storm water within the site, e.g. separate clean and dirty water streams around the plant, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the panels).	SolaireDirect Southern Africa (Pty) Ltd	Design
Retain a buffer (approximately 50 - 100 m wide) of intact natural vegetation along the perimeter of each development site.	SolaireDirect Southern Africa (Pty) Ltd	Design
Retain a buffer of at least 20m around cemeteries identified on site.	SolaireDirect Southern Africa (Pty) Ltd	Design
Retain a buffer of at least 32 m from drainage lines on site.	SolaireDirect Southern Africa (Pty) Ltd	Design
Use bird-friendly power line towers and conductor designs.	SolaireDirect Southern Africa (Pty) Ltd	Design
In designing the facility, use should be made of existing road infrastructure as far as possible. Where no road infrastructure exists, new roads should be placed within existing disturbed areas or management measures must be implemented to ensure minimum damage is caused to natural habitats.	SolaireDirect Southern Africa (Pty) Ltd / Design engineer	Design phase
Roads must be designed so that changes to surface water runoff are avoided or minimised and erosion is not initiated.	SolaireDirect Southern Africa (Pty) Ltd / Design engineer	Design phase
The facility should be designed in such a manner to allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water.	SolaireDirect Southern Africa (Pty) Ltd / Design engineer	Design phase
Obtain permits for protected plant removal and relocation prior to commencement of activity in an area	SolaireDirect Southern Africa (Pty) Ltd /	Design phase

Mitigation: Action/Control	Responsibility	Timeframe
	Design engineer	

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the Environmental Impact Assessment Report.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.

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

» ***Access Road*** - The site can be accessed easily via the R709 main road which crosses through the proposed sites and farm gravel roads. The farm roads will be upgraded and used to access the facility site. Access track construction would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The strength and durability properties of the rock strata at the proposed site are not known at this stage; this will need to be assessed via a geotechnical study to be conducted by the project proponent. Depending on the results of these studies, it may be possible, in some areas, to strip off the existing vegetation and ground surface and level the exposed formation to form an access track surface. The final layout of the access roads will be determined following the identification of site related sensitivities. These roads will be approximately 4 m in width, and will be gravel based.

» ***Power line*** – A 22kV/132kV overhead power line will be constructed from the on-site substation in each phase to connect to the Eskom Excelsior substation, which is located north-west of the proposed Merapi Solar Facility. These proposed power lines will range between 50-1000 m in length for each phase.

Project Component/s	» Power line. » Access roads.
Potential Impact	» Route that degrades the environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, and erosion.
Activities/Risk	» Alignment of power line.

Sources	» Alignment of access roads.
Mitigation: Target/Objective	» 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 that curtails environmental impacts and enhances environmental benefits.	SolaireDirect Southern Africa (Pty) Ltd	Prior to submission of the final construction layout plan
Locate power line and access roads within disturbed corridors, as far as possible.	SolaireDirect Southern Africa (Pty) Ltd	Prior to submission of the final construction layout plan
Consider design level mitigation measures recommended by the specialists as detailed within the Environmental Impact Assessment report and relevant appendices.	SolaireDirect Southern Africa (Pty) Ltd	Design
Plan any new access roads according to contour lines to minimise cutting and filling operations.	SolaireDirect Southern Africa (Pty) Ltd	Design

Performance Indicator	» Power line and road alignments meet environmental objectives. » Selected linear alignments that minimise any negative environmental impacts and maximise any benefits.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the Environmental Impact Assessment Report through review of the design by the Project Manager, and the ECO prior to the commencement of construction.

OBJECTIVE: Minimise storm water runoff (guideline for storm water management plan)

Management of storm water will be required during the construction and operational 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 the relevant method statements during the construction and operation phases of the facility.

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be submitted to the ECO.	SolaireDirect Southern Africa (Pty) Ltd	Pre-construction
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	SolaireDirect Southern Africa (Pty) Ltd	Planning and design
Appropriately plan hard-engineered bank erosion protection structures to minimise erosion potential.	SolaireDirect Southern Africa (Pty) Ltd	Planning and design
Ensure suitable handling of storm water within the site (i.e. separate 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) through appropriate design of the facility.	SolaireDirect Southern Africa (Pty) Ltd	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.	SolaireDirect Southern Africa (Pty) Ltd	Planning and design

Performance Indicator	» Appropriate storm water management measures included within the facility design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

OBJECTIVE: Search and Rescue of All Translocatable Indigenous Plants

Prior to any earthworks (including road construction) within areas of natural vegetation, a plant Search and Rescue program should be developed and implemented (refer to Appendix F of the EMP for guidelines in this regard). The section below provides a guideline for the Search & Rescue Plan on site and will need to be supplemented with the relevant methodology depending on the final placement of infrastructure.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Substantially increased loss of natural vegetation at construction phase and waste of on-site plant resources, and lack of locally sourced material for rehabilitation of disturbed areas. » increased cost of having to buy in material for rehabilitation.
Activities/Risk Sources	» Construction related loss and damage to remaining natural vegetation via heavy machinery, etc.
Mitigation: Target/Objective	» Rescue, maintenance and subsequent replanting of at least 40% of the natural vegetation in all development footprints within any areas of natural vegetation on site

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an appropriate plant Search and Rescue program	SolaireDirect Southern Africa (Pty) Ltd	Planning and design
Search and Rescue (S&R) of certain translocatable, selected succulents, shrubs and bulbs occurring in long term & permanent hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. All such development footprints must be surveyed and pegged out as soon as possible, and then a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. All rescued species should be bagged (and cuttings taken where appropriate) and kept in the horticulturist's or a designated on-site nursery, and should be returned to site once all construction is completed and rehabilitation of disturbed areas is required. Replanting should only occur in spring or early summer (August to January), once the first rains have fallen, in order to facilitate establishment. Plants that can be considered for rescue are all bulbs and succulents, and certain shrubs.	Specialist	Prior to construction

Performance Indicator	» Horticulturist to submit list of target species to botanist for approval. » Rescue of material. » Replanting in rehabilitation areas to cover 40% of these areas within 3 months of replanting.
Monitoring	» ECO to monitor Search and Rescue. » Horticulturist to liaise with botanist. » Botanist to review rehabilitation success after 3 months of replanting of rehabilitation areas.

OBJECTIVE: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational 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
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: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in Appendix A) 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.	SolaireDirect Southern Africa (Pty) Ltd	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	SolaireDirect Southern Africa (Pty) Ltd / Contractor	Pre-construction (construction procedure) Pre-operation

Mitigation: Action/control	Responsibility	Timeframe
site personnel. This procedure should be in line with the South African Labour Law.		(operation procedure)
Liaison with landowners is to be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	SolaireDirect Southern Africa (Pty) Ltd / Contractor	Pre-construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMP.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

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

» Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on any remaining indigenous natural vegetation and habitats of ecological value (specifically no go areas identified through the EIA).
» Minimises impacts on fauna using the site.
» Minimises the impact on heritage sites should they be uncovered.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

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

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

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

Project Manager will:

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

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

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

An independent **Environmental Control Officer** (ECO) must be appointed by SolaireDirect Southern Africa (Pty) Ltd prior to the commencement of any authorised activities. The ECO will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMP 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 (once issued).
» Be fully knowledgeable with the contents with the EMP.
» Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.

» Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
» Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
» Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
» Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
» Ensure that activities on site comply with all relevant environmental legislation.
» Ensure that appropriate measures are undertaken to address any non-compliances recorded.
» Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMP.
» Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.
» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Independently report to DEA in terms of compliance with the specifications of the EMP and conditions of the Environmental Authorisation (once issued).
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.

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, provided that compliance with the requirements of the Environmental Authorisation, EMP and environmental legislation is maintained. In the absence of the ECO there should be a designated 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 EMP. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

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

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

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

6.2 Objectives

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

OBJECTIVE: Minimise impacts related to inappropriate site establishment

Project Component/s	» Area infrastructure (i.e. PV panels, and substation). » Linear infrastructure (i.e. power line, and access roads).
Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species
Activities/Risk Sources	» Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	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.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.	Contractor	Site establishment Duration of construction
The construction camp used to house equipment must	Contractor	Erection:

Mitigation: Action/Control	Responsibility	Timeframe
be located in a disturbed area and must be screened as far as practical off during the entire construction phase.		during site establishment Maintenance: for duration of Contract
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All development footprints should be appropriately fenced off and clearly demarcated.	Contractor	Site establishment, and duration of construction
All unattended open excavations shall be adequately demarcated and/or fenced.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including drainage lines.	Contractor	Site establishment, and duration of construction
Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction

Performance Indicator	» 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	» An incident reporting system will be used to record non-conformances to the EMP. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE: Appropriate management of the construction site and construction workers

The construction phase of the PV facility is expected to extend over a period of 18-24 months for each phase. Approximately 291 people are expected to be required during the construction phase. Ideally low skilled and semi-skilled positions will be filled by locals living in and around Excelsior, Winburg, Ladybrand and Bloemfontein. This will however be dependent on the skills availability in the area. Workers not living 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.

Project Component/s	» Area and linear infrastructure.
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
The siting of the construction equipment camp/s must take cognisance of no go and sensitive areas identified by the EIA studies. The location of this construction equipment camp/s shall be approved by the project ECO and must be as indicated in the final layout approved by the DEA.	Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate all disturbed areas at the construction equipment camp as soon as possible after construction is complete within an area.	Contractor	Duration of Contract
Ensure waste removal facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
The terms of this EMP and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts.	SolaireDirect Southern Africa (Pty) Ltd	Tender process
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
No one other than the ECO or personnel authorised by the ECO may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Draft and implement a Code of Conduct for construction workers.	Contractor and sub-contractor/s	Pre-construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the	Contractor and sub-	Construction

Mitigation: Action/Control	Responsibility	Timeframe
conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	contractor/s	
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction
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.	SolaireDirect Southern Africa (Pty) Ltd Contractor	Pre-construction

Performance Indicator	» The construction activities have avoided no go and sensitive areas, as approved by the ECO. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported by the ECO. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate wastewater treatment works. » An incident reporting system should be used to record non-conformances to the EMP. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

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

Although limited, employment opportunities could be created during the construction phase (i.e. ~291), 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 and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» 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	» SolaireDirect Southern Africa (Pty) Ltd, in discussions with the GLM, should aim to employ a minimum of 80% of the low-skilled workers from the local area. This should also be made a requirement for all contractors. SolaireDirect Southern Africa (Pty) Ltd should also develop a database of local BEE service providers

Mitigation: Action/Control	Responsibility	Timeframe
Attempt to employ a majority of the low-skilled workers from the local area in line with employment and business policy document that sets out local employment targets.	SolaireDirect Southern Africa (Pty) Ltd & contractors	To be in place before construction phase commences.
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that local employment target is met.	SolaireDirect Southern Africa (Pty) Ltd	To be initiated prior to the initiation of the construction phase
Skills audit to be undertaken to determine training and skills development requirements.	SolaireDirect Southern Africa (Pty) Ltd	To be undertaken within 1-month of commencement of construction phase

Mitigation: Action/Control	Responsibility	Timeframe
		commences.
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	SolaireDirect Southern Africa (Pty) Ltd	Before construction phase commences.
Identify potential opportunities for local businesses.	SolaireDirect Southern Africa (Pty) Ltd	Pre-construction

Performance Indicator	» Employment and business policy document that sets out local employment and targets completed before construction phase commences; » Majority of semi and unskilled labour locally sourced. » Database of potential local BEE services providers in place before construction phase commences. » Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase.
Monitoring	» SolaireDirect Southern Africa (Pty) Ltd and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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 and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential Impact	» The presence of construction workers who live outside the area and who are housed in local towns can affect family structures

	and social networks.
Activities/Risk Sources	» The presence of construction workers can affect 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.

Mitigation: Action/Control	Responsibility	Timeframe
Attempt to ensure that the majority of the low-skilled workers are sourced from the local area. This should be included in the tender documents. Construction workers should be recruited from the local area in and around Excelsior, Winburg, Ladybrand and Bloemfontein	SolaireDirect Southern Africa (Pty) Ltd and contractors	Construction phase.
Identify local contractors who are qualified to undertaken the required work.	SolaireDirect Southern Africa (Pty) Ltd	Pre-construction
Develop and implement a Code of Conduct to cover the activities of the construction workers housed on the site	SolaireDirect Southern Africa (Pty) Ltd	Pre-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.	SolaireDirect Southern Africa (Pty) Ltd and contractors	Pre-construction
Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	SolaireDirect Southern Africa (Pty) Ltd and contractors	Pre-construction
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dismissed. All dismissals must be in accordance with South African labour legislation.	Contactors	Construction phase
Provide opportunities for workers to go home over weekends.	Contactors	Construction phase
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.	Contactors	Construction phase

Performance Indicator	» 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. » Local construction workers employed have proof that they have lived in the area for five years or longer. » Tender documents for contractors include recommendations for construction camp. » MF set up prior to implementation of construction phase. » Code of Conduct drafted before commencement of construction phase. » Briefing session with construction workers held at outset of construction phase.
Monitoring	» SolaireDirect Southern Africa (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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.

The components for the proposed facility will be transported to site by road. The study site is accessible via an existing secondary gravel road off the N8. There are a number of vehicles anticipated on site during the construction phase of the facility, with the exact number depending on the final transport plan devised by the EPC partner during the final design phase of the facility.

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	» Delivery of any component required within the construction phase.
Potential Impact	» 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	» 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	» 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
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.	SolaireDirect Southern Africa (Pty) Ltd and ECO	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	SolaireDirect Southern Africa (Pty) Ltd and Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	Contractor and ECO	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 working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor and ECO	Construction

Mitigation: Action/Control	Responsibility	Timeframe
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions and other standard traffic control information.	Contractor	Duration of contract

Performance Indicator	» 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	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure

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

Project Component/s	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential Impact	» Impact on safety of farmers and communities (increased crime etc.) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
Mitigation: Target/Objective	» To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Consider establishing a Monitoring Forum (MF) with the adjacent farmers and develop a Code of Conduct for construction workers.	SolaireDirect Southern Africa (Pty) Ltd and contractors	Pre-construction
Inform all workers of the conditions contained in the Code of Conduct.	SolaireDirect Southern Africa (Pty) Ltd Contractor	Pre-construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Construction phase

Performance Indicator	» Community MF in place before construction phase commences. » Code of Conduct developed and approved prior to commencement of construction phase.

	» All construction workers made aware of Code of Conduct within first week of being employed. » Compensation claims settled within 1 month of claim being verified by Community MF.
Monitoring	» SolaireDirect Southern Africa (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. .

OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase

Construction activities of the proposed facility could lead to the loss of productive farm land.

Project component/s	» Construction phase activities associated with the establishment of the PV facility and associated infrastructure.
Potential Impact	» The footprint of the solar energy facility and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
Activities/risk sources	» The footprint occupied by the solar energy facility and associated infrastructure.
Mitigation: Target/Objective	» To minimise the loss of land taken up by the PV facility and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe
Minimise the footprint of the PV facility and the associated infrastructure.	Contractor and SolaireDirect Southern Africa (Pty) Ltd	Pre-construction
Rehabilitate disturbed areas on completion of the construction phase. Details of the rehabilitation programme should be contained in the EMP.	Contractors	Construction

Performance Indicator	» Footprint of PV facility included in the Construction Phase EMP. » Meeting/s held with farmers during construction phase. .
Monitoring	» ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: To avoid and or minimise the potential impacts of safety, 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 PV facility, including infrastructure etc.
Potential Impact	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activities/Risk Sources	» 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 minimise damage to roads.

Mitigation: Action/Control	Responsibility	Timeframe
Implement appropriate dust suppression measures for heavy vehicles and ensure that vehicles used to transport building materials are fitted with tarpaulins or covers.	Contractors	Duration of Construction
Ensure that all vehicles are road-worthy; drivers are qualified and are made aware of the potential noise, dust and safety issues.	Contractors	Duration of Construction
Ensure that drivers adhere to speed limits. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractors	Duration of Construction
Ensure that damage to roads is repaired before completion of construction phase.	Contractors	Duration of Construction

Performance Indicator	» Dust suppression measures implemented for all areas 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	» SolaireDirect Solar Energy and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Minimisation of development footprint and disturbance to topsoil

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

Project Component/s	» PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» Impacts on natural vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	» Site preparation and earthworks. » Excavation of foundations. » Construction of site access road. » Site preparation (e.g. compaction). » Power line construction activities. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats. » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Any fill material required must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until	Contractor	Site establishment

Mitigation: Action/Control	Responsibility	Timeframe
replaced during rehabilitation.		& duration of contract
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
As far as possible, the maximum topsoil stockpile height must not exceed 2 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	Contractor	Duration of contract

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimise the impacts on and loss of indigenous vegetation and faunal habitat

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. 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	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	» Vegetation clearing. » Introduction of alien invasive plant species » Construction of access roads. » Placement of power line towers.

	» Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	» Minimise footprints of disturbance of vegetation/habitats. » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
A site rehabilitation programme must be developed and implemented.	Contractor in consultation with Specialist	Duration of contract Pre-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	Pre-construction

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation and faunal habitats. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

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

On-going alien and invasive plant monitoring and removal should be undertaken on all areas of natural vegetation within the project lease area on an annual basis. The section below provides a guideline for the Invasive Plant Management

Plan and should be implemented together with consideration of the principles contained in the Department of Water Affairs: Working for Water Programme (refer to Appendix B).

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

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants. » Remove all alien plants from areas adjacent to or on frequently traversed access routes to prevent dispersal of regenerative material onto site	Contractor	Construction and operation
Establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).	Contractor	Construction and operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation
DWA approved methodology should be employed for all invasive clearing operations. *Prosopis, Eucalyptus, Rubus, Cereus, Melia, Verbena, Argemone and Opuntia are* the primary invasive shrub. No bulldozing or removal by any machinery except chainsaws is allowed, as this disturbs the soil and creates ideal conditions for re-invasion. All stems must be cut as close to ground level as possible, using loppers or chainsaws (depending on size). No herbicide spraying should be undertaken anywhere, due to the extensive collateral damage. All cut branches should be stacked into a pyramid (cut end up) and left to dry – where rodents will eat the available seed under the pile, reducing seed	Contractor	Construction and operation

Mitigation: Action/Control	Responsibility	Timeframe
germination. Should this method not be feasible due to volumes of biomass, all cut branches shall be shredded. Shredded material of cut branches that do not contain any seed or other regenerative material can be kept for rehabilitation. Annual follow ups are required in all areas that have been previously cleared (to be undertaken between January and April). Small seedlings may be hand pulled.		

Performance Indicator	» For each invasive or alien species: number of plants and aerial cover of plants within project area and immediate surroundings is significantly reduced and alien species are absent from site.
Monitoring	» On-going monitoring of area by ECO during construction. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area and used in optimising the control programme. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

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 in areas that are underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to the construction activity (excessive wetting, uncontrolled discharge, etc) will also lead to accelerated erosion and possible sedimentation along natural drainage lines or catchment areas.
» Degradation of the natural soil profile due to excavation, removal of topsoil, stockpiling, wetting, compaction, pollution and other construction activities may affect soil forming processes and associated agricultural potential.

Management of erosion will be required during the construction 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 Erosion Management plan included in Appendix C.

Project Component/s	» PV arrays and foundations to support them. » Substation. » Access roads. » Underground cabling. » Storage and maintenance facilities and foundations to support them. » Overhead power lines and substation linking the facility to the electricity grid.
Potential Impact	» Soil degradation including erosion, dust and siltation. » Reduction in agricultural potential.
Activities/Risk Sources	» Earthworks & activity on site. » Rainfall and concentrated discharge causing water erosion of disturbed areas. » Wind - erosion of disturbed areas.
Mitigation: Target/Objective	» Minimise soil degradation (removal, excavation, mixing, wetting, compaction, pollution, etc.). » Minimise erosion. » Minimise sediment transport downstream (siltation). » Minimise dust pollution.

Mitigation: Action/Control	Responsibility	Timeframe
Identify areas of high erosion risk (drainage lines/watercourses, existing problem areas). Only special works to be undertaken in these areas to be authorised by ECO and Engineer's representative (ER)	Specialist	At design stage.
Identify construction areas for general construction work and restrict construction activity to these areas.	EER/Contractor	At design stage and during construction
Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling)	EER/Contractor	During construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary degradation of soil. Special attention to be given to roads that cross drainage lines and roads on steep	Contractor	At design stage and during construction

Mitigation: Action/Control	Responsibility	Timeframe
slopes (to prevent unnecessary cutting and filling operations).		
Dust control on construction site through wetting or covering of cleared areas.	Contractor	Daily during construction
Minimise removal of vegetation which aids soil stability.	Contractor	Continuously during construction
Rehabilitate disturbance areas as soon as an area is vacated.	Contractor	Continuously during and after construction
Soil conservation - stockpile topsoil for re-use in rehabilitation phase. Protect stockpile from erosion. Topsoil should be stockpiled below 1 m height and for as short a period as possible to ensure survival of the soil seed bank and other soil-borne organisms.	Contractor	Continuously during construction
Erosion control measures- run-off control and attenuation on slopes (sand bags, logs), silt fences, stormwater channels and catch-pits, shade nets, soil binding, geofabrics, hydroseeding or mulching over cleared areas.	Contractor	Erection: Before construction Maintenance: Duration of contract
Where access roads cross natural drainage lines, culverts must be designed to allow free flow. Regular maintenance must be carried out.	Contractor	Before construction and maintenance over duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	Contractor	Before construction and maintenance over duration of contract

Performance Indicator	» Only authorised activity outside construction areas. » No activity in no-go areas. » Acceptable level of activity within construction areas, as determined by ECO. » Acceptable level of soil erosion around site, as determined by ECO. » Acceptable level of sedimentation along drainage lines, as determined by ECO. » Acceptable level of soil degradation, as determined by ECO. » Acceptable state of excavations, as determined by ER & ECO.

Monitoring	» Monthly inspections of the site by the ECO. » Monthly inspections of sediment control devices by the ECO. » Monthly inspections of surroundings, including drainage lines by the ECO. » Immediate reporting of ineffective sediment control systems by the ECO. » An incident reporting system will record non-conformances.

OBJECTIVE: Minimising the impact on archaeological sites

Five heritage sites were identified near the site (i.e. more than 200m away) and are referred to as: Merap-1, 2, 3, 4 and Merap-5. Of these 5 sites 2 were deemed important. No mitigation measures are proposed for these sites because they fall outside the development footprint. However, it is advised that the developer avoid these sites as possible as he/she can.

Project Component/s	» Solar Array » Roads » Power line » Construction equipment camp
Potential Impact	» Destruction of archaeological sites
Activity/Risk Source	» Solar array foundations, power lines and roads
Mitigation: Target/Objective	» Conserve archaeological sites

Mitigation: Action/control	Responsibility	Timeframe
Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner such that an investigation and evaluation of the finds can be made.	Contractor, ECO, specialist	Duration of construction

Performance Indicator	» No destruction of archaeological sites
Monitoring	» Monitoring of excavation activities by ECO.

OBJECTIVE: Minimising the impact on Paleontological sites

In terms of the Paleontological resources in the study area, the site of the proposed Merapi Solar Park is underlain sediments of the Adelaide and Tarkastad subgroups, Beaufort Group (Karoo Supergroup). The Beaufort Group is composed of sandstone and mudrock and ranges in thickness from 5000m to 150m or less (Groenewald 1989). The Beaufort Group (Karoo Supergroup) of formations are rich in Triassic and Permian fossils (Johnson et al., 2006). Vertebrate fossils including retiles, mammal-like reptiles (Therapsids) amphibians and fish remains occur in the Beaufort Group (Rubidge et al., 1995). Invertebrate fossils, invertebrate burrows and trails, well-preserved leaf impressions, silicified wood and stem impressions have also been recorded from a number of localities in the Beaufort Group (Anderson et al., 1998; McLachlan & Anderson 1973; 1977; Riek, 1973, 1976, Rubidge et al., 1995).

Project Component/s	» Solar Array » Roads » Power line » Construction equipment camp
Potential Impact	» Destruction of paleontological sites
Activity/Risk Source	» Solar array foundations, power lines and roads
Mitigation: Target/Objective	» Conserve paleontological sites

Mitigation: Action/control	Responsibility	Timeframe
Paleontological monitoring in areas where bedrock is expected to be disturbed.	ECO	During construction phase

Performance Indicator	» No destruction of paleontological sites
Monitoring	» Paleontological monitoring by ECO during the construction phase where bedrock is to be affected.

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, various buildings, a generator, a substation, a power line, a fence and internal access roads.
Potential Impact	»	Potential scarring and erosion due to the unnecessary removal of vegetation.
Activity/Risk Source	»	The viewing of the above-mentioned by observers on or near the site.
Mitigation: Target/Objective	»	Minimal disturbance to vegetation cover in close vicinity to the proposed solar energy facilities.

Mitigation: Action/Control	Responsibility	Timeframe
Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.	SolaireDirect Southern Africa (Pty) Ltd / contractors	Construction
Limit access to the construction sites to existing access roads.	SolaireDirect Southern Africa (Pty) Ltd / contractors	Construction / operation
Rehabilitate all disturbed areas to acceptable visual standards.	SolaireDirect Southern Africa (Pty) Ltd / contractors	Construction / operation
Maintain the general appearance of the facility in an aesthetically pleasing way.	SolaireDirect Southern Africa (Pty) Ltd / operator	Operation
Consider installing anti-reflective coating or glass to reduce the sunlight that is reflected and increase the amount of sunlight that is absorbed, create the shortest possible route for transmission lines between individual phases and substations to	SolaireDirect Southern Africa (Pty) Ltd / contractors	Construction / operation

Mitigation: Action/Control	Responsibility	Timeframe
reduce its visual appearance and consider laying electrical cables underground en-route to the substation.		
It is furthermore recommended that the proposed project phases be relocated to the south-eastern portions of the subject property (eastern portions of Farms Concordia and Ceylon). The northern phases of the project on the Farm Moedersgift No. 566 (phases 1 and 2) presents the areas which are most visually prominent. A relocation of this particular phase to an area further away from the receptors in Excelsior would benefit the project from a visual perspective. In addition, it is proposed that the project phases that front onto movement corridors be set back at least 200m from the latter roads in order to establish a proper buffer between the observer and the observed view.	SolaireDirect Southern Africa (Pty) Ltd / contractors	Construction / operation

Performance Indicator	» Vegetation cover that remains intact with no erosion
Monitoring	» Monitoring of vegetation clearing during the construction phase

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 guideline for integrated management of construction waste is included as Appendix D of this EMP.

Project Component/s	» PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» 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	» Packaging. » Other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks, and site preparation.
Mitigation: Target/Objective	» 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.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	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.	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.	Contractor	Duration of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	» 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. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Appropriate handling and storage of chemicals, 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	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	» 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 environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an emergency preparedness plan during the construction phase.	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.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
tray must be used to contain any fuel or oils.		
All stored fuels to be maintained within a bund and on a sealed surface. 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.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substations must be removed from site by licensed contractors.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	» 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 EMP.

OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase

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

Project Component/s	» Construction and establishment activities associated with the establishment of PV facility, including infrastructure etc.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers 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
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	SolaireDirect Southern Africa (Pty) Ltd and contractors	Duration of construction
Provide adequate fire fighting equipment onsite.	SolaireDirect Southern Africa (Pty) Ltd and contractors	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractors	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Duration of construction
Join Fire Protection Agency	SolaireDirect Southern Africa (Pty) Ltd	Pre-construction

Performance Indicator	» Conditions contained in the Construction EMP. » 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. » Compensation claims settled within 1 month of claim being verified by Community MF. .

Monitoring	» SolaireDirect Southern Africa (Pty) Ltd and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

6.3 Detailing Method Statements

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

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

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the 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:

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

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 bunded 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 SolaireDirect Southern Africa (Pty) Ltd Construction Manager (or may be delegated to the ECO) /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.

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

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 EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.
» Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
» Employees must undergo training for the operation and maintenance activities associated with a PV 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.

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 EMP. This training and awareness will be achieved in the following ways:

6.4.1 Environmental Awareness Training

Environmental Awareness Training must take the form of an on-site talk and demonstration by the ECO 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 ECO on site.

6.4.2 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 Officer on site.

6.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) 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. 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.

6.5 Monitoring Programme: Construction Phase

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, SolaireDirect Southern Africa (Pty) Ltd will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

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

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

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

6.5.1 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.

6.5.2 Monitoring Reports

A monitoring report will 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.

6.5.3 Final Audit Report

A final environmental audit report must be submitted to DEA upon completion of the construction and rehabilitation activities. This report 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 EMP.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

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

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

7.1. Objectives

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

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

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

Refer to Appendix B of the EMP for principles on rehabilitation. A detailed rehabilitation plan must be compiled in consultation with an appropriately qualified specialist once the construction plan has been finalised.

Project Component/s	» Area and linear infrastructure.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas. » Temporary access roads/tracks. » Power line servitudes. » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste	Contractor	Following

Mitigation: Action/Control	Responsibility	Timeframe
materials must be removed from site.		execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked. Compacted surfaces of temporary roads must be ripped to facilitate their rehabilitation.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
A rehabilitation plan that specifies the rehabilitation process should be compiled in consultation with an appropriately qualified specialist.	Contractor, SolaireDirect Southern Africa (Pty) Ltd and specialist	Pre-construction
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist as applicable.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	SolaireDirect Southern Africa (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage lines as necessary.	SolaireDirect Southern Africa (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation
On-going invasive and alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	SolaireDirect Southern Africa (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

Overall Goal: To ensure that the operation of the 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 EMP.

8.1. Objectives

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

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

Project component/s	» 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	» Disturbance to or loss of vegetation and/or habitat.

	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	» Movement of employee vehicles within and around site. » Excessive shading by PV panels. » Altered rainfall interception and resultant runoff patterns by infrastructure.
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	SolaireDirect Southern Africa (Pty) Ltd	Operation
No disturbance of vegetation outside of the project site must occur.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	SolaireDirect Southern Africa (Pty) Ltd	Operation
An on-going invasive and alien plant monitoring and eradication programme must be implemented, where necessary (refer to Appendix B).	SolaireDirect Southern Africa (Pty) Ltd	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	SolaireDirect Southern Africa (Pty) Ltd in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
A botanist familiar with the vegetation of the area should monitor the vegetation composition and –density immediately adjacent to new infrastructure and decide on additional revegetation measures that may be required to maintain sufficient vegetation to prevent habitat degradation and accelerated erosion, especially underneath/around PV panels.	SolaireDirect Southern Africa (Pty) Ltd in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area

Performance Indicator	» 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	» Observation of vegetation on-site by facility manager and environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE: Protection of avifauna

During the operation of the facility, the threat of collision with the power line is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

Project Component/s	» Power line.
Potential Impact	» Collision and electrocution events with the overhead power line.
Activities/Risk Sources	» Operation of the power line without mitigation measures. .
Mitigation: Target/Objective	» Maintain a low number of collision, and electrocution events.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure bird-friendly tower designs are implemented to minimise the risk of electrocutions. Fit overhead power lines with appropriate flappers in areas of sensitivity to increase the visibility thereof to avifauna.	SolaireDirect Southern Africa (Pty) Ltd	Design and Construction
Notes of electrocution and collision events must be sent to a qualified Ornithologist for the recommendation of further mitigation measures if necessary.	ECO and avifauna specialist	Operation

Performance Indicator	» Minimal collision or electrocution events.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitudes for mortalities.

OBJECTIVE: The mitigation and possible negation of the potential visual impact of lighting at the solar energy facility

The primary visual impact of the facility and its ancillary infrastructure, including the power line, is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Project Component/s	Solar energy facility lighting fixtures.
Potential Impact	The potential night time visual impact of lighting fixtures on observers in proximity to the site.
Activity/Risk Source	The effects of glare and light trespass on motorists and observers.
Mitigation: Target/Objective	The containment of light emitted in order to eliminate the risk of additional night time visual impacts. Minimal usage of security and other lighting.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that proper planning is undertaken regarding the placement of lighting structures and that light fixtures only illuminate areas inside the substation sites.	SolaireDirect Southern Africa (Pty) Ltd / lighting engineer	Planning / construction
Undertake regular maintenance of light fixtures.	SolaireDirect Southern Africa (Pty) Ltd / operator	Operation

Performance Indicator	» The effective containment of the light on the site and no complaints from observers.
Monitoring	» The monitoring of the condition and functioning of the light fixtures during the operational phase of the project

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 Erosion Management plan included in Appendix C of the EMP.

Project Component/s	» PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation and/or revegetation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » 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.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (logs), silt fences, storm water catch-pits, and shade nets).	SolaireDirect Southern Africa (Pty) Ltd	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an appropriate stormwater management plan for the operational phase of the facility	SolaireDirect Southern Africa (Pty) Ltd	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager. » Acceptable level of increased siltation in drainage lines, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis. » Water management plan

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	» Hard engineered surfaces. » On-site vehicles.
Potential Impact	» Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and the augmentation plant.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» 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.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Appropriate dust suppression must be applied to the roads as required to minimise/control airborne dust.	SolaireDirect Southern Africa (Pty) Ltd	Duration of contract
Speed of vehicles must be restricted, as defined by the Environmental Manager.	SolaireDirect Southern Africa	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
	(Pty) Ltd	
Vehicles and equipment must be maintained in a road-worthy condition at all times.	SolaireDirect Southern Africa (Pty) Ltd	Duration of contract

Performance Indicator	» 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	» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Ensure the implementation of an appropriate fire management plan 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 personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the 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.	SolaireDirect Southern Africa (Pty) Ltd	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate fire fighting equipment on site.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Provide fire-fighting training to selected operation and maintenance staff.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	SolaireDirect Southern Africa (Pty) Ltd	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.).	SolaireDirect Southern Africa (Pty) Ltd	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.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Contact details of emergency services should be prominently displayed on site.	SolaireDirect Southern Africa (Pty) Ltd	Operation

Performance Indicator	» Fire fighting equipment and training provided before the operational phase commences. » Appropriate fire breaks in place and maintained.
Monitoring	» SolaireDirect Southern Africa (Pty) Ltd must monitor indicators listed above to ensure that they have been met.

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

The facility is expected to be operational for more than 20 years during which time approximately 60 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 should 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 60 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
The workforce of 60 permanent staff is likely to be based in Excelsior, Winburg, Ladybrand and Bloemfontein. SolaireDirect Southern Africa (Pty) Ltd should commit to implementing a 5-year training and skills development and training programme to maximise employment for locals.	SolaireDirect Southern Africa (Pty) Ltd	Prior to commencement of operation
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	SolaireDirect Southern Africa (Pty) Ltd	Prior to commencement of operation

Performance Indicator	» 5 year training and skills development programme developed and designed before construction phase completed. » Potential locals identified before construction phase completed.
Monitoring	» SolaireDirect Southern Africa (Pty) Ltd must monitor indicators listed above to ensure that they have been met for the operational phase.

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.

A guideline for integrated management of waste is included as Appendix D of this EMP.

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 area.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	SolaireDirect Southern Africa (Pty) Ltd	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.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	SolaireDirect Southern Africa (Pty) Ltd	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	SolaireDirect Southern Africa (Pty) Ltd	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	SolaireDirect Southern Africa (Pty) Ltd / waste management contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	SolaireDirect Southern Africa (Pty) Ltd / 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	SolaireDirect Southern Africa (Pty) Ltd	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	SolaireDirect Southern Africa (Pty) Ltd	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	SolaireDirect Southern Africa (Pty) Ltd	Operation

Performance Indicator	» 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	» Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO. » All appropriate waste disposal certificates accompany the monthly reports.

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of 20 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.

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 EMP to be revisited and amended.

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.

9.1. Site Preparation

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

9.2 Disassemble and Replace Infrastructure

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

OBJECTIVE: To avoid and or minimise the potential 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. However, the number of people

	affected (60) is relatively small. 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	Operator	When PV facility is decommissioned
The developer should establish an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 25 - 30 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.	Operator	Decommissioning
Rehabilitation should start immediately after decommissioning is completed.	Operator	Straight after Decommissioning
All excavations must be rehabilitated with soil and topsoil, which should not contain invasive plant species (in compliance with the CARA, as amended), to the satisfaction of the environmental manager.	Operator	Decommissioning
Re-vegetation specifications to be developed.	Operator	Decommissioning
All building materials must be removed from the site. All compacted surfaces must be ripped and re-vegetated as per the re-vegetation specifications.	Operator	Decommissioning
The most suitable seed mix for disturbed areas to be used in rehabilitation would include indigenous species.	Operator	Decommissioning
Rehabilitation to be conducted in a progressive manner (i.e. once decommissioning in an area has been completed the area will be rehabilitated).	Operator	Decommissioning

Mitigation: Action/control	Responsibility	Timeframe
The rehabilitation of the area with indigenous vegetation must coincide with the rainfall events and all alien invasive vegetation shall be removed.		
Rehabilitation measures for the site are to include the following: » Re-contouring Subsoil stockpiles should be used to re-contour construction affected areas. The Contractor shall restore the profile, soil condition and landform to as close as possible state to the pre-construction state. » Scarification and ripping All areas where rehabilitation interventions are required shall be cross-ripped before topsoil placement. Topsoil and fertile soil shall be uniformly scarified to allow for vegetation growth » Fertilising The Contractor shall be required to perform soil analysis tests on the top 75mm of prepared surface prior to re-vegetation/seeding to determine the required fertiliser levels for permanent cover. » Seed acquisition The Contractor shall purchase seed from a South African National Seed Organisation (SANSOR) accredited dealer. Seed used for rehabilitation shall not be older than one season. Purchased seed must be of the correct species and of known origin, dried and packed, conforming to all legal requirements for seed.	Operator	Decommissioning
The operator shall schedule works for placing of topsoil once all infrastructure has been successfully decommissioned. Seeding can then take place after the first rains of the season and should be concluded by one month before the end of the growing season.	Operator	Decommissioning
The seed mix for use in rehabilitation must be an approved mix of indigenous grass species common to the area.	Operator	Decommissioning

Mitigation: Action/control	Responsibility	Timeframe
The operator shall maintain rehabilitated areas free of weeds and invader plants until the end of the Defects Notification Period applicable to rehabilitation. Control of weeds and invader plants must be done in accordance with the specifications stipulated in the CARA.	Operator	Decommissioning
The operator shall be responsible for the prevention of erosion in areas impacted upon by their activities. All erosion repairs must be implemented at the first signs thereof and no erosion shall be allowed to develop on a large scale.	Operator	Decommissioning
If required, at the time of decommissioning, the operator must submit a method statement to the DWA / DEA to manage and rehabilitate the work in any wetlands. Wetlands shall be rehabilitated immediately after decommissioning has been completed as these are sensitive habitats and disturbance must be kept to a minimum. The beds of the wetlands shall be restored to a similar state, in terms of the soil profile, as well as physical and chemical properties as established in the pre-construction survey.	Operator	Decommissioning
All recyclable rubble and solid waste (e.g. scrap metal, cables, bottles, cans, and plastic residues) shall be collected and disposed of through a registered recycling company. Waste manifests will be kept by the Contractor and shown to the ECO on request. All non-recyclable rubble and solid waste shall be collected and disposed of at an approved waste disposal site. Waste manifests will be shown to the ECO on request.	Operator	Decommissioning

Performance Indicator	» South African Labour legislation relevant at the time
Monitoring	» SolaireDirect Southern Africa (Pty) Ltd and Department of Labour » Environmental Manager to monitor rehabilitation

FINALISATION OF THE EMP CHAPTER 10

The EMP is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMP be updated to include site-specific information and specifications following the final walk-through survey by specialists of the power line, and development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.

APPENDIX A:
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

AIM

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

- Fair and equitable;
- Open and transparent;
- Accountable and efficient.

1 It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

Proposed generic grievance process

- Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
- The grievance will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
- The contact person will draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting.
- Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism

process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

- The meeting will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent. The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.
- Draft copies of the minutes will be made available to the Complainant and the proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.
- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s will note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned;
- In the event that the parties agree to appoint a mediator, the proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the proponent, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will provide a person to take minutes of and record the meeting/s.
- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator will prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.

- The draft report will be made available to the Complainant and the proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days.

The way forward will be informed by the recommendations of the mediator and the nature of the grievance. As indicated above, the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the proponent, either party may be of the opinion that legal action may be the most appropriate option.

APPENDIX B:
DEPARTMENT OF WATER AFFAIRS: WORKING FOR WATER PROGRAMME PRINCIPLES FOR INVASIVE PLANT SPECIES

APPENDIX C:
EROSION MANAGEMENT PLAN

APPENDIX D:
GUIDELINES FOR INTEGRATED MANAGEMENT OF CONSTRUCTION WASTE

APPENDIX E:
SPECIFICATIONS FOR EARTHWORKS
(ENVIRONMENTAL MEASURES)

APPENDIX F:
PLANT SEARCH & RESCUE PLAN