
PROPOSED SIRIUS SOLAR PV PROJECT ONE NORTHERN CAPE 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

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

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 EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

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

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

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

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

APS Invest One (Aurora Power Solutions) is proposing to establish two commercial photovoltaic solar energy facilities, as well as associated infrastructure on a site located approximately 20 km south-west of Upington, in the Northern Cape Province. The project is known as the **Sirius PV Solar PV Project One** (refer to Figure 1.1).

This EMPr deals with the Sirius Solar PV Project One (14/12/16/3/3/2/469). APS Invest One has identified a technically feasible site located on the remaining extent of the Farm Tungsten Lodge 638 within the Kai !Garib Local Municipality, Northern Cape Province (refer to **Figure 1.1**). This broader site, which is approximately 1913 ha in extent, is technically preferred for the development of a solar energy facility by way of the solar resource, the topography, and slope of the site, the current land use, availability of the land for lease by the developer, accessibility to the land, and the potential for power evacuation options.

The proposed project will be comprised of the following primary elements (refer to **Figure 1.2**):

- » Arrays of photovoltaic panels with an export capacity of up to 75MW.
- » Mounting structure to support the PV panels.
- » Cabling between the projects components, to be lain underground where practical.
- » A new on-site substation to evacuate power from the PV panels to the Eskom grid. Various power line alternatives for were considered including:
 - Power Line:
 - * Alternative 1: this power line alternative is approximately 3.7 km in length and lies on the south eastern side of the site and runs parallel to the Oasis- Oranje No.1 132 kV power line to connect to the proposed Eskom substation located adjacent to the proposed site.
 - * Alternative 2: this power line alternative is approximately 3.1 km in length and lies on the eastern side of the proposed site. Power would feed into the Eskom electricity network via a 'loop in and loop out' configuration to the existing Eskom Gordonia-Oasis Rural 132 kV power line.
- » Internal access roads and fencing.
- » Workshop area for maintenance, storage, and offices.

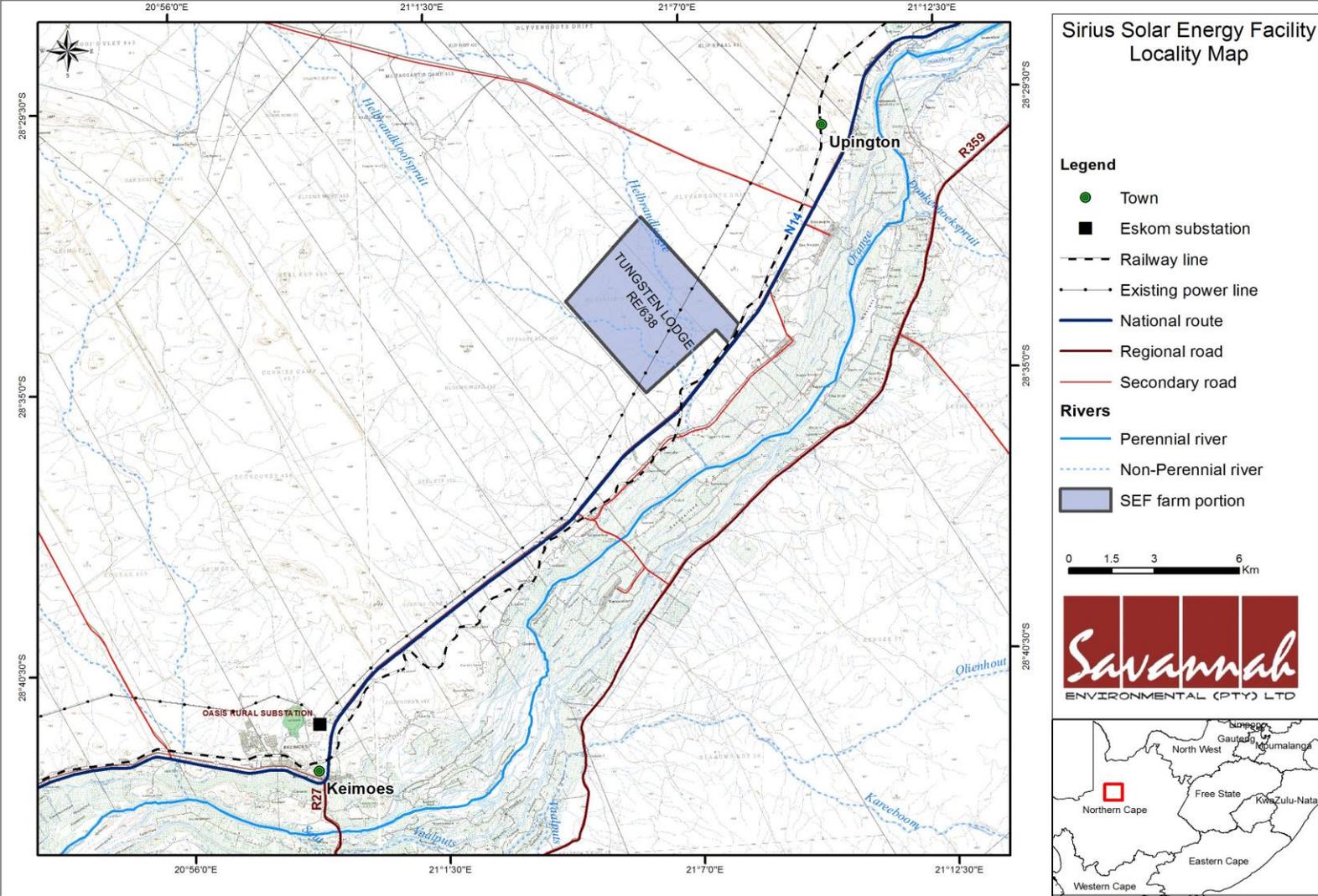


Figure 1.1: Locality map showing the broader study site (Project One & Project Two) identified for the proposed Sirius facility

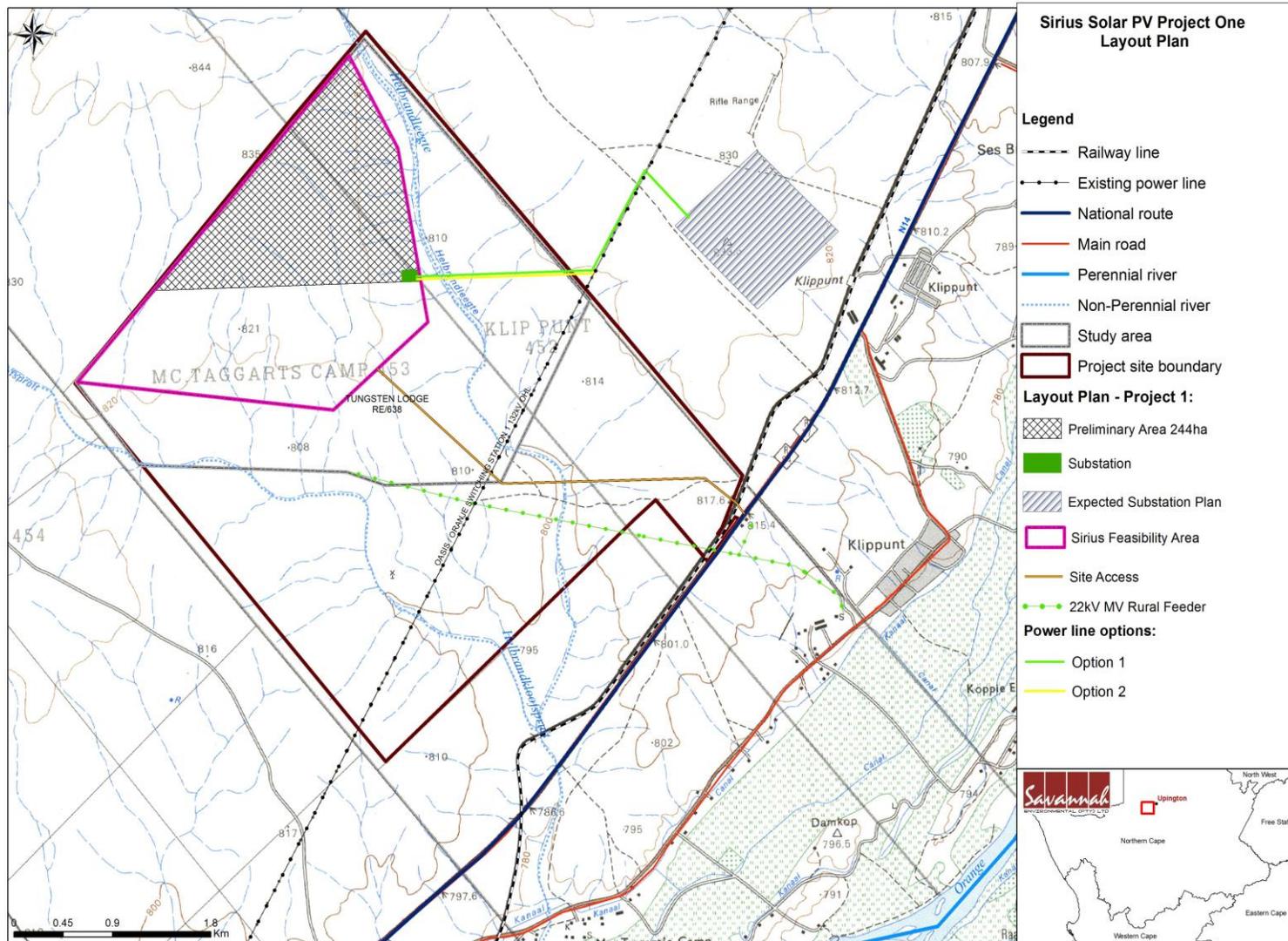


Figure 1.2: Layout map showing the layout of the proposed Sirius Solar PV Project One

1.1. Activities and Components associated with the Solar Energy Facility

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

Construction Phase:

The construction phase is expected to extend over a period of 18-24 months and will create approximately ~291 employment opportunities, depending on the final design. Of this total ~ 100 will be available to low-skilled workers (construction labourers, security staff etc.) and semi-skilled workers (drivers, equipment operators etc.) and ~ 120 to skilled personnel (engineers, land surveyors, project managers etc.). The work associated with the construction phase will be undertaken by contractors and will include the establishment of the Sirius Solar PV Project and the associated components, including, access roads, the on-site substation and power line.

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

Typically the construction will operate as a 'follow the leader' where the ground-works 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 work (refer to **Table 1.1**).

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: <ul style="list-style-type: none"> » <i>Geotechnical survey</i> – the geology and topography of the study area will be confirmed. The geotechnical study will look at flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be built and the extent of earthworks and compaction required in the establishment of any internal access roads. » <i>Site survey</i> – this will be required to finalise the design layout of the solar field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation (once issued) for the facility.
Establishment of access roads	<ul style="list-style-type: none"> » Access to the site will use existing roads where possible and where there are no existing roads, new roads will be constructed. However, further roads may need to be established for construction and maintenance purposes. The extent of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase of the facility. » Internal roads within the study site may need to be established to provide access during construction and operational phase. These roads will be approximately 7m in width.
Undertake site preparation	<ul style="list-style-type: none"> » Site preparation activities will include clearance of vegetation at the footprint of the area infrastructure (i.e. substation, ancillary buildings) and linear component (i.e. internal access roads). These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. » Site preparation will also include the fencing of the site.
Transport of components and equipment to site	<ul style="list-style-type: none"> » The components for the proposed facility will be transported to site, in sections, by road. Some of the components for the power generation may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)¹ by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, and compaction equipment etc.) as well as components required for the establishment of the substation and power line. » In some instances, the dimensional requirements of the loads to be transported during the construction phase (e.g. 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	<ul style="list-style-type: none"> » Once the required construction equipment has been transported to site, dedicated equipment camp(s) and laydown area(s) will be required which will be of a temporary nature and approximately 20 m x 10 m 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

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

Activity	Description
	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	» Earth screws or H Bars will be mechanically placed into the ground. » The installation of the underground cables (i.e. between the PV panels, inverters, and substation) will require the excavation of trenches of approximately 60 cm wide x 100 cm deep within which they can then be laid. » The PV panels will be joined to form numerous loops located 6 m apart. » A dedicated inverter and step up transformer station will be allocated for every 1MW.
Establishment of substation and power line	» Electricity distribution infrastructure will be put up to include one substation of up to a maximum dimension of 150m x 150m as well as a new power line to loop in loop out of the existing power line that runs on the western boundary of the site. » The on-site substation will include transformers which will step-up the power generated by the PV panels. The on-site substation will step up the voltage from 22 KV to 132 kV needed for connection to the grid. » The construction of the on-site substation and its associated infrastructure will require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation, and connection of equipment.
Undertake site rehabilitation	» Once construction is completed and all construction equipment is removed, the areas affected by construction activities must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site that are not required during the operational phase or by the landowner must be closed and prepared for rehabilitation.

Operation and Maintenance Phase:

The operational phase is expected to extend for a period of approximately 20 – 25 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 (water) and the maintenance of the solar facility components and associated infrastructure (such as access roads). The photovoltaic plant will be operational during daylight hours only. However, it will not be operational under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed.

Activity	Description
Operation of the PV panels and the associated electrical infrastructure	<ul style="list-style-type: none"> » The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). » The inverters will change the power from direct to alternating current. Thereafter the electricity will be conveyed to the substation via the underground cabling, and the 132 kV power line will transmit the electricity generated to the national grid via the Eskom’s substation. » Occasional cleaning of the panels will be required throughout the life cycle of the facility when necessary.
Site operation and maintenance	<ul style="list-style-type: none"> » Full-time security, maintenance, and control room staff will be required on site. » Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities. » The access to the site and the internal access roads will be maintained during the operational phase.

Decommissioning Phase

The PV panels and associated infrastructure would only be decommissioned once they have reached the end of their economic life. It is most likely that decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time. The following decommissioning activities will form part of the project scope.

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

Through the assessment of impacts associated with the Sirius Solar PV Project One, both potentially positive and negative impacts have been identified. Areas of high sensitivity within the development footprint have been identified through the EIA studies and are indicated on the sensitivity map (refer to **Figure 1.3**). The final layout for the proposed facility will consider the identified sensitive areas and will need to be approved by DEA. From the conclusions of the EIA, the most significant environmental impacts associated with the proposed project include:

Impacts on Ecology

The study area is covered by the Bushmanland Arid Grasslands merging into Kalahari Karroid Shrubland as described by Mucina and Rutherford (2006), with riverine vegetation on the banks of small ephemeral waterwashes that drains into the Orange River, about 7 km south-east of the study area. Although these vegetation types are regarded as least threatened, the relatively high biodiversity of these undulating plains have medium to high conservation priority on a local scale, as described by the ZF Mgcau Environmental Management Framework. Impacts on natural vegetation should therefore be minimised as far as possible.

Annual and geophytic species have highly variable emerging patterns, depending on the timing and amount of rainfall received during a season. It is thus expected that the diversity of geophytic and annual species within the study area will be higher than could be determined during the survey.

All riparian vegetation around natural vleis and large intermittent rivers should be avoided by all development-related activities, except the necessary crossing of access routes and power lines. The latter should cross where the lowest amount of indigenous trees are present. Access roads to the development should follow existing tracks as far as possible. Where new access routes will be necessary, suitable erosion control measures must be taken.

Few alien invasive plants have been observed on the study site, but several grow in close proximity along major access routes. For all species, there is a very high risk of spread throughout the project area following disturbance. A detailed Invasive Plant Management Plan must be compiled and implemented prior to commencement of activity and be diligently followed and updated throughout the project cycle up to the decommissioning phase.

It is not expected that the development will compromise the survival of any specific flora or terrestrial vertebrate species on the study area or beyond if mitigation measures are fully implemented. The most significant impacts are expected to be on ecosystem health and functionality, which should remain

relatively intact if all mitigation recommendations are implemented. Possible cumulative impacts are thus expected to be fully avoidable. The project will have **medium – low impacts on ecology**.

From an ecological perspective, power line Alternative 2 is nominated as the preferred option provided that the recommendations regarding the location of this line across the ephemeral stream on the site are followed.

Soil and Agricultural Potential Impacts

The development will have **low to medium negative impact on soils, agricultural resources and productivity**, but it will also deliver low to medium positive impacts on agriculture. Grazing, the only current land use will be able to continue unaffected on all other parts of the farm for the duration of the project. The significance of agricultural impacts is influenced by the fact that the solar panel sites have extremely limited agricultural potential. The farm has a land capability classification of class 7, non-arable and low potential grazing land. Soils are predominantly shallow Mispah soils on underlying rock with only small interspersed pockets of deeper Hutton soils between them. Four potential negative impacts of the development on agricultural resources and productivity were identified as:

- » Loss of agricultural land use caused by direct occupation of land by the energy facility footprint (medium significance with and without mitigation).
- » Soil Erosion caused by alteration of the surface run-off characteristics (medium significance without, but low with mitigation).
- » Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).
- » Degradation of veld due to vehicle trampling and dust deposition (low significance with and without mitigation).
- » One potential positive impact of the development on agricultural resources and productivity was identified as:
 - * Generation of alternative land use income through rental for energy facility on agriculturally unproductive land. This will provide land owners with increased rural livelihood (medium significance with and without mitigation).

Both power line alternatives are considered acceptable from an agricultural potential and soils perspective. There is no preference in this regard.

Water Resources

With suitable mitigation and implementation of the proposed layout, the development should have limited impact on the overall status of the riparian

systems on the site and immediate surrounds. A flood line calculation study (determination of the 1:100 year flood line) must however be undertaken by the developer to inform the final development footprint and ensure minimal impact on these systems. All riparian vegetation around natural vleis and large intermittent rivers should be avoided by all development-related activities, except the necessary crossing of access routes and the power line. All **impacts on water courses** that were assessed as being of **moderate significance** could readily be reduced to low significance by appropriate mitigation.

Both the power line alternatives investigated cross the Helbrandleegte spruit. It may be possible to span the power line across the spruit to limit impact on it. It is assumed that pylons will be placed outside of any watercourse (dry river beds) and they would thus have a no direct impact on the aquatic environment. Therefore both Alternative 1 and Alternative 2 can be developed.

Heritage Impacts

Based on the Phase 1 Archaeological Impact Assessment (AIA) study and survey it was found that no significant heritage sites occur on the site. Four areas of low concentration of stone tools were recorded. These four "heritage sites" are very common in the Northern Cape Province and are of low heritage significance. It was found that none of the tool concentration warranted protection or mitigation action. The occurrence of these Stone Tools suggests that sub-surface heritage sites could occur. In addition, due to the close proximity of the area to the Orange River, it is prone to alluvial deposits that could bury any Stone Age sites. Therefore, it is recommended that a suitably qualified heritage practitioner be appointed by the developer to perform periodic inspections (preferably fortnightly) of excavated materials during the construction phase to ensure that no sub-surface sites are damaged.

The two alternative power line alignments for the Sirius Project One development were investigated. The alignments roughly follow the same route there is no preferred alignments as their impact will be similar. Alternative 2 requires a shorter power line to connect to the existing infrastructure than Alternative 1 and therefore the impact of Alternative 2 for Project One should be conceivably lower than the impact of Alternative 1. No important sites were identified in either power line corridor or on the substation site.

Visual Impacts

The findings of the Visual Impact Assessment undertaken for the Sirius One Solar PV Project) indicated that the environment surrounding the site, especially within a 2.5km - 5km radius, will be visually impacted upon for the anticipated operational lifespan of the facility (i.e. 20 - 30 years). The proposed facility

would be visible within an area that may incorporate certain sensitive visual receptors. These primarily include users of the N14 national road traversing near the proposed development. The solar energy facility could potentially have a **moderate** visual impact on road users travelling along the N14 national road traversing south-east of the facility. This impact may be mitigated to **low**. The potential visual impact on residents of homesteads in close proximity to the solar energy facility is expected to be **negligible** due to the general absence of settlements and residences in close proximity (4km radius) of the proposed solar energy facility. The visual impact on the users of roads and the residents of towns, settlements and homesteads within the region (i.e. beyond a 5km radius) is expected to be **low** for the proposed solar energy facility, both before and after the implementation of mitigation measures. The potential visual impact of construction activities on sensitive visual receptors within close proximity to the proposed solar energy facility is likely to be of **moderate** significance, both before and after the implementation of mitigation measures. The potential visual impact associated with lighting at the facility at night (especially glare) is expected to be of **moderate** significance and may be mitigated to **low**. The anticipated visual impacts listed above (post mitigation measures) are on average expected to be of **low to moderate** significance. . The area already has a CSP project under construction and an Eskom CSP has been authorised which will have significant impact on the viewshed of the area. The most significant impact associated with these projects and associated infrastructure is the visual impact on the scenic resources and cultural landscape of this region imposed. It should however be borne in mind that the Sirius Solar PV structures are highly unlikely to be viewed in isolation, as the much taller CPV structures (solar troughs, heliostats and central receiver) of the Abengoa (!Khi) solar energy facility, is expected to generally dominate the observer's frame of view. The solar energy facility development is not considered to be fatally flawed from a visual perspective.

The two overhead power line alternatives are expected to have a **negligible** visual impact when viewed against the backdrop of the much more prominent PV structures and the existing and future infrastructure (e.g. CSP facilities, Eskom substation, etc.) proposed for the broader area.

The alternatives proposed for the Sirius Solar PV facility are not expected to yield differing viewshed analyses results, due to their location immediately adjacent and parallel to each other. From a visual impact perspective the shortest route, i.e. alternative 2, would be preferred. This is based purely on the premise that the shorter the line, the lower the potential visual impact. The area surrounding the proposed power line infrastructure is also generally devoid of sensitive visual receptors, further lowering the risk of potential visual impact.

Impacts on the Social Environment

The findings of the SIA indicate that the development of the proposed Sirius solar energy facility will create employment and business opportunities for locals during both the construction and operational phase of the project. The enhancement measures listed in the report should be implemented in order to enhance these benefits. In addition, the proposed establishment of a number of other renewable energy facilities in the area will create significant socio-economic opportunities for the KGLM, which, in turn, will result in a positive social benefit. The establishment of a Community Trust funded by revenue generated from the sale of energy from the proposed solar energy facility also creates an opportunity to support local economic development in the area. Given the size of the proposed facility (75MW) this will represent a significant 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 the proposed Sirius solar energy facility is therefore supported by the findings of the SIA. The **potential positive and negative social impacts** of the project will be of a **medium – low significance**.

The social impacts associated with power line alternative 1 and 2 are likely to be low as they do not impact on residential structures. However, given the shorter distances associated with alternative 2, alternative 2 is the preferred power line option.

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 17.8 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 technical viability of establishing a 75 MW solar energy facility in the Upington area of the Northern Cape Province has been established by **APS Invest One**. The positive implications of establishing a solar energy facility on the demarcated sites within the Northern Cape Province include:

- » The potential to harness and utilise solar energy resources within the Northern Cape Province
- » The project would assist the South African government in reaching their set targets for renewable energy.
- » The project would assist the South African government in the implementation of its green growth strategy and job creation targets.
- » The project would be within the solar corridor identified by the Northern Cape Spatial Development Plan, thereby assisting in meeting the objective in this regard.
- » The project would assist the district and local municipalities in reducing levels of unemployment through the creation of jobs and supporting local business
- » The National electricity grid in the Northern Cape Province would benefit from the additional generated power.
- » Promotion of clean, renewable energy in South Africa
- » Creation of local employment, business opportunities and skills development 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.

PURPOSE AND OBJECTIVES OF THE EMPr

CHAPTER 2

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

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

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

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

This EMPr has the following objectives:

- » Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility.
- » Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
- » Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

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

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

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

STRUCTURE OF THIS EMPr

CHAPTER 3

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

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

These chapters set out the procedures necessary for Sirius Solar PV Project One ,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 EMPr has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

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

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

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

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

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

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

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

Table 3.1: Management plans for the proposed project

Plans required	Location in report
Grievance Mechanism for Public Complaints and Issues	Appendix A
Guidelines for Integrated Management of Construction Waste	Appendix B
Norms and Standards for Storage of Waste	Appendix C
Alien Invasive Management Plan	Chapter 6, Objective (n)
Re-Vegetation and Habitat Rehabilitation Plan	Chapter 7, Objective (a)
Traffic & Transport Management Plan	Chapter 6, Objective (e)
Storm Water Management Plan	Chapter 5, Objective (d)
Erosion Management Plan	Chapter 6, Objective(o) Chapter 8, Objective (c)
Plant Rescue and Protection Plan	Chapter 6, objective (k)

3.1. Project Team

This draft EMPr was compiled by:

	Name	Company
EMPr Compilers:	Lusani Rathanya Ravisha Ajodhapersadh Karen Jodas	Savannah Environmental
Specialists:	Marianne Strohbach	Savannah Environmental
	Johan Lanz	Johann Lanz Consulting
	Brian Colloty	Scherman Colloty & Associates
	Stephan Gaigher	G & A Heritage
	Lourens du Plessis	MetroGIS
	Tony Barbour	Tony Barbour Environmental Consulting and Research

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

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

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

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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	<p>The Environmental 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.</p> <p>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>In terms of GN R543, R544, R545 and R546 of 18 June 2010, an Environmental Impact Assessment Process is required to be undertaken for the proposed project.</p>	Department of Environmental Affairs – competent authority Department of Environmental and Nature Conservation (DENC)- commenting authority	The listed activities triggered by the proposed solar energy facility have been identified and assessed in the Environmental Assessment Process being undertaken. This EIA 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)	<p>In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.</p> <p>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	Department of Environmental Affairs	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Process through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of

			the project.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs Department of Environmental and Nature Conservation (DENC)- Local Authorities	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.
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 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.	Department of Water Affairs Provincial Department of Water Affairs	A water use license (WUL) is required to be obtained 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 extracted from groundwater (borehole on site) for use within the facility, a water use license will be required in terms of Section 21(a) and 21 (b) of the National Water Act.
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	Department of Mineral Resources	As no borrow pits are expected to be required for

	<p>a borrow pit) in accordance with the provisions of the Act.</p> <p>Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.</p> <p>S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resources that might occur on site.</p>		<p>the construction of the facility, no mining permit or right is required to be obtained.</p> <p>A Section 53 application will be submitted the Northern Cape DMR office.</p>
<p>National Environmental Management: Air Quality Act (Act No 39 of 2004)</p>	<p>Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013.</p> <p>Measures to control noise (S34) - no regulations promulgated yet.</p>	<p>Department of Environmental Affairs</p>	<p>No permitting or licensing requirements arise from this legislation.</p> <p>The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act. The air quality officer may require a dust monitoring programme as per the Regulations for dust control</p>

<p>National Heritage Resources Act (Act No 25 of 1999)</p>	<ul style="list-style-type: none"> » Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and paleontological 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 for the presentation of archaeological sites as part of tourism attraction (S44). 	<p>South African Heritage Resources Agency</p>	<p>An HIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix D3)</p>
<p>National Environmental Management: Biodiversity Act (Act No 10 of 2004)</p>	<ul style="list-style-type: none"> » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a 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), and vulnerable 	<p>Department of Environmental Affairs</p>	<p>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.</p> <p>Specialist flora and fauna studies (refer to Appendix D1) have been undertaken as part of the EIA Process. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected</p>

	<p>(VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011).</p> <ul style="list-style-type: none"> » This Act also regulates alien and invader species. » 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. 		<p>species and the potential for them to be affected has been considered.</p>
<p>Conservation of Agricultural Resources Act (Act No 43 of 1983)</p>	<ul style="list-style-type: none"> » 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). 	<p>Department of Agriculture</p>	<p>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.</p>
<p>National Forests Act (Act No. 84 of 1998)</p>	<p>According to this act, the Minister has declared 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,</p>	<p>National Department of Forestry</p>	<p>An application will be made to DAFF should the development impact on protected trees</p>

	<p>sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister’.</p>		
National Veld and Forest Fire Act (Act 101 of 1998)	<p>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.</p> <p>In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.</p>	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)	<p>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.</p> <p>Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance</p> <p>Group IV: any electronic product; and</p>	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.

	<p>Group V: any radioactive material.</p> <p>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>		
Development Facilitation Act (Act No 67 of 1995)	<p>Provides for the overall framework and administrative structures for planning throughout the Republic.</p> <p>S (2 - 4) provides general principles for land development and conflict resolution.</p>	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)	<p>Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province</p>	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)	<p>The Minister may by notice in the <i>Gazette</i> publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. 	<p>National Department of Water and Environmental Affairs</p> <p>Provincial Department of Environmental Affairs (general waste)</p>	<p>As no waste disposal site is to be associated with the proposed project, no permit is required in this regard.</p> <p>Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance</p>

	<p>In terms of the Regulations published in terms of this Act (GN 718), An Environmental Impact Assessment is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unfit 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. 		<p>with the requirements of the Act, as detailed in the EMP.</p> <p>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).</p>
<p>National Road Traffic Act (Act No 93 of 1996)</p>	<ul style="list-style-type: none"> » The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort 	<ul style="list-style-type: none"> » South African National Roads Agency Limited (national roads) » Provincial Department of Transport 	<p>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 carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional</p>

	<p>requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</p>		<p>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).</p>
Provincial Legislation			
<p>Northern Cape Nature Conservation Act, Act No. 9 of 2009</p>	<p>This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:</p> <ul style="list-style-type: none"> » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto 	<p>Provincial Department of Environmental Affairs</p>	<p>Permitting or licensing requirements arise from this legislation for the proposed activities to be undertaken for the proposed project as there are a succulent plants species on the proposed development site. A permit is required to remove the plants.</p>
	<ul style="list-style-type: none"> » or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province. 		
Local Legislation			
<p>ZF Mgcawu Environmental Management Framework (EMF)</p>	<p>The purpose of strategies is to create a mechanism for implementing action to address some of the most pertinent issues that came out of the EMF. The</p>		<p>The proposed facility does not require a permit but</p>

	<p>strategies are focused on the alleviation of potential key development/environment friction areas by providing direction in respect to how these friction areas should be dealt with. The following strategies have been compiled:</p> <ul style="list-style-type: none">» Strategy for the protection and conservation of high quality natural vegetation across the Siyanda District » Strategy for development on sensitive areas in the Orange River floodplain » Protection of sensitive environmental features on large properties across Siyanda » Strategy for the protection of sensitive environmental features surrounded or abutted by small properties.	<p>will be applicable throughout the project phase</p>
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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

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

The study area is covered by the Bushmanland Arid Grasslands merging into Kalahari Karroid Shrubland as described by Mucina and Rutherford (2006), with riverine vegetation on the banks of small ephemeral waterwashes that drains into the Orange River, about 7 km south-east of the study area. Although these vegetation types are regarded as least threatened, the relatively high biodiversity of these undulating plains have medium to high conservation priority on a local scale, as described by the ZF Mgawu Environmental Management Framework.

Several protected plant species occur within the study area, some with red data status, and many of the bulbous protected species can be relocated with relative ease.

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

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

Once the layout has been designed, a detailed investigation of the footprint area by an ecologist, during the optimal growing season and as described below must be conducted before the layout is finalised and activity commences.

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

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Avoid all riparian vegetation around natural vleis and large intermittent rivers » Only the riparian vegetation around the small man-made dam could be compromised » Ensure that a buffer of at least 100 m, preferably more, is maintained around all larger intermittent rivers and their riparian vegetation to maintain the species diversity and buffering capacity of these plains surrounding riparian vegetation » Design the access route to follow existing tracks as 	APS Invest One	Design phase

Mitigation: Action/Control	Responsibility	Timeframe
<p>far as possible by doing the following:</p> <ul style="list-style-type: none"> * following the main farm gravel road to position 28°34'00.5" S; 21°06'33.6" E * from there upgrade the farm track to the abandoned farmhouse at position 28°33'39.8" S; 21°06'20.9" E * reduce further distances of the access track by combining access to the two development phases as much as possible <p>» Design the power line route to cross the intermittent river and riparian vegetation at a point that has no <i>Acacia erioloba</i> or <i>Boscia albitrunca</i> trees, preferably at the approximate position of:</p> <ul style="list-style-type: none"> * 28°33'17.63" S; 21°06'41.55" E 		
<p>Undertake pre-construction walk-through footprint investigations for protected flora and burrowing terrestrial vertebrates:</p> <p>The final footprint investigation (walkthrough) is aimed to fully inform the developer, responsible conservation authority (that will issue the relevant permits and authorisations), contractors, EO and ECO about:</p> <ul style="list-style-type: none"> » Protected and red data species that will be affected by the development <ul style="list-style-type: none"> * indicating the red-data and protection status of each species observed (what red-data classification, which legislation) » Location of protected plant species within the footprint area – either individually mapped or approximate areas of occurrence (alternatively, for linear structures, between which structures or other markers) » Identification of the affected species by providing a representative photo record that enables ECO and contractors to identify such plants » How many specimens per species will be affected – relatively accurate estimate to the nearest 50, more accurate if less than 50 » Which species can be successfully relocated, which and how many will have to be destroyed » Location and nature of any nesting sites or active burrows of vertebrate species (birds, amphibians, reptiles and mammals), mapped by GPS, that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed 	<p>APS Invest One/Specialist</p>	<p>Design review phase</p>

Mitigation: Action/Control	Responsibility	Timeframe
<p>person(s)</p> <ul style="list-style-type: none"> » Approximate location and nature of any alien invasive species that will have to be cleared by the contractor » Location and nature of any other significant environmental concerns, e.g. extreme gully erosion, that will need to be addressed by the contractor to prevent any unnecessary (further) degradation of the development footprint » Note: should more than 1000 specimens of any critically endangered or endangered species be affected, as risk assessment report for that species must be prepared according to Section 15 of the NEMA:BA Draft Threatened or Protected Species Regulations, Gazetted General Notice 388 of 2013. 		
<p>The above pre-construction footprint investigations will be used together with results from the ecological specialist report to draft the following:</p> <ul style="list-style-type: none"> » A comprehensive alien invasive species eradication and management plan 	<p>APS Invest One/Specialist</p>	<p>Design review phase</p>
<p>Obtain permits for protected plant removal and relocation prior to commencement of any activity related to this development</p> <ul style="list-style-type: none"> » As a minimum, permits will be required to remove all or some of the following species: <ul style="list-style-type: none"> * <i>Acacia erioloba</i> * <i>Adenium oleifolium</i> * <i>Aloe spp*</i> * <i>Anacampseros sp*</i> * <i>Asclepias stellifera</i> * <i>Avonia albissima</i> * <i>Babiana hypogaea</i> * <i>Boscia albitrunca</i> * <i>Boscia foetida</i> * <i>Euphorbia striata*</i> * <i>Gethyllis sp*</i> * <i>Jamesbrittenia glutinosa</i> * <i>Manulea nervosa</i> * <i>Microloma sagittatum</i> * <i>Moraea polystachya</i> * <i>Nerine laticoma</i> * <i>Oxalis spp</i> * <i>Psilocaulon coriarium</i> * <i>Ruschia spinosa</i> * <i>Tavaresia barklyi*</i> * <i>Stapelia sp</i> 	<p>APS Invest One/Contractor</p>	<p>Pre- commence- ment</p>

Mitigation: Action/Control	Responsibility	Timeframe
<p>* observed outside development area on Tungsten Lodge, could be affected by access road or other related activities, could be present on development area</p>		
<p><i>Sociable weavers' nests occur within the development area; these should be avoided as far as possible. Nests may only be removed with a permit and by a suitably qualified specialist, usually supervised by conservation staff</i></p>	<p>APS Invest One/Contractor</p>	<p>Pre-commencement</p>
<p>Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the EIA Report</p> <ul style="list-style-type: none"> » This includes positioning components of the development as close as possible together and in close proximity to other existing or planned developments in the area » Strictly adhere to existing tracks/roads where ever possible to gain access to the site » Sites for storing, mixing, and handling topsoil piles (if necessary) or any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 500 m from any type of wetland. Such sites must be clearly indicated in site plans and the drafting of relevant detailed method statements and/or management plans requested from the relevant contractor or environmental firm. 	<p>APS Invest One</p>	<p>Prior to finalisation of facility layout plan</p>
<p>Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of topsoil, prevent obstruction or alteration of natural water flow</p>	<p>APS Invest One</p>	<p>Design phase</p>
<p>Compile a comprehensive erosion control plan for the footprint area as part of the final design of the project</p>	<p>APS Invest One/Specialist</p>	<p>Design phase</p>
<p>Permissible biodiversity:</p> <ul style="list-style-type: none"> » Depending on the final PV array and mechanism developed and taking all potential impacts, fire risks and maintenance requirements into consideration, it has to be decided upon and made clear: <ul style="list-style-type: none"> * Permissible vegetation: maximum height, desirable density and composition * Maintenance of this vegetation – mowing, small livestock grazing, etc. Note: due to the close 	<p>APS Invest One/Specialist</p>	<p>Design phase</p>

Mitigation: Action/Control	Responsibility	Timeframe
<p>proximity of rivers to the site, there may be no application of herbicides</p> <ul style="list-style-type: none"> * Permissible terrestrial fauna that could be allowed to migrate/return to the area below/between the PV arrays – including species that must be excluded due to potential damage to the development 		
<p>After the permissible biodiversity has been determined, compile a comprehensive vegetation rehabilitation management plan.</p>	<p>APS Invest One/Specialist</p>	<p>Design phase</p>
<p>Depending on the type of PV panels selected for the development, a response and management plan must be drafted and available to deal with accidental breakages and potential release of harmful substances. This plan must include as a minimum:</p> <ul style="list-style-type: none"> » Specifications of harmful substances that could be released from accidental breakages of PV panels » How such harmful substances can best be salvaged and removed as soon as an accidental breakage has occurred » How and where broken components and potential harmful substances can be disposed of – it must also be indicated if any material can be recycled, and where materials must then be taken for recycling <ul style="list-style-type: none"> ○ The above will have to be incorporated into the waste management plan 	<p>APS Invest One/Specialist</p>	<p>Design phase</p>

<p>Performance Indicator</p>	<ul style="list-style-type: none"> » Grid connection and road alignments meet environmental objectives. » Solar components and all associated temporary and permanent infrastructure and access road alignments meet environmental objectives » Ecosystem fragmentation is kept to a minimum » Ecosystem functionality is retained and any unjustified disturbance and degradation prevented
<p>Monitoring</p>	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and the ECO prior to the commencement of activity.

b) OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the Proposed Sirius One Solar PV Project

Project Component/s	The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, transformer, substation, security lighting, and workshop).
Potential Impact	Primary visual impact of the facility due to the presence of the PV panels and associated infrastructure as well as the visual impact of lighting at night.
Activity/Risk Source	The viewing of the facility by observers on or near the site (i.e. within 2 km of the site) as well as within the region.
Mitigation: Target/Objective	Optimal planning of infrastructure to minimise visual impact.

Mitigation: Action/control	Responsibility	Timeframe
Retain and maintain natural and / or cultivated vegetation in all areas outside of the development footprint.	APS Invest One/ design consultant	Early in the planning phase.
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the solar energy facility and the ancillary infrastructure. The following is recommended: » Shield the sources of light by physical barriers (walls, vegetation, or the structure itself); » Limit mounting heights of fixtures, or use foot-lights or bollard lights; » Make use of minimum lumen or wattage in fixtures; » Making use of down-lighters or shielded fixtures; » Make use of Low Pressure Sodium lighting or other low impact lighting. » Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes. »	APS Invest One/ design consultant	Early in the planning phase.
» Utilise existing access roads?	APS Invest One/ design consultant	Early in the planning phase.

Performance Indicator	<ul style="list-style-type: none"> » Grid connection and road alignments meet environmental objectives. » Minimal exposure of PV panels, ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 2 km) and within the region.
Monitoring	Ensure that the proposed project is developed in the authorised development footprint to avoid visual impacts on surrounding areas

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

- » **Access Road** - Access to the development site is afforded by means of a 2.3km stretch of existing secondary (gravel) road that joins the N14 national road near the small town of Klippunt, supplemented by another approximately 3km of new roads to each of the projects.
- » **Power line** -
 - * Alternative 1: lies on the south eastern side of the site and runs parallel to the Oasis- Oranje 1 132 kV power line to connect to the proposed Eskom substation located adjacent to the proposed site.
 - * Alternative 2: lies on the eastern side of the proposed site and power would feed into the Eskom electricity network via a 'turn in and turn out' configuration to the existing Eskom Gordonia-Oasis Rural 132 kV power line.

Project Component/s	<ul style="list-style-type: none"> » 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 Sources	<ul style="list-style-type: none"> » Alignment of power line. » Alignment of access roads.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure selection of best environmental option for alignment of linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Select a power line alignment within the preferred corridor assessed that curtails environmental impacts and enhances environmental benefits.	APS Invest One	Final design
Locate power line and access roads within disturbed	APS Invest One	Final design

Mitigation: Action/Control	Responsibility	Timeframe
corridors, as far as possible.		
Consider design level mitigation measures recommended by the specialists as detailed within the EIA report and relevant appendices.	APS Invest One	Design
Utilise existing roads as far as possible.	APS Invest One	Design

Performance Indicator	<ul style="list-style-type: none"> » Power line and road alignments meet environmental objectives. » Selected linear alignments that minimise any negative environmental impacts and maximise any benefits.
Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager and the ECO prior to the commencement of construction.

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

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be compiled and submitted to the ECO.	APS Invest One	Pre-construction
Design infrastructure in order to reduce the potential	APS Invest	Planning and

Mitigation: Action/Control	Responsibility	Timeframe
increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	One	design
Appropriately plan hard-engineered bank erosion protection structures.	APS One	Invest 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.	APS One	Invest 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.	APS One	Invest Planning and design

Performance Indicator	<ul style="list-style-type: none"> » Appropriate storm water management measures included within the facility design. » Sound water quality and quantity management during construction and operation.
Monitoring	<ul style="list-style-type: none"> » Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

e) 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	<ul style="list-style-type: none"> » Solar energy facility » Associated infrastructure
Potential Impact	<ul style="list-style-type: none"> » Impacts on affected and surrounding landowners and land uses
Activity/risk source	<ul style="list-style-type: none"> » Activities associated with solar energy facility construction » Activities associated with solar energy facility operation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » 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
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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.	APS Invest One	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	APS Invest One	Pre-construction (construction procedure) Pre-operation (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.	APS Invest One	Pre-construction

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

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 remaining indigenous natural vegetation and habitats of ecological value.
- » Minimises impacts on fauna using the site.
- » Minimises the impact on heritage site should they be uncovered.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

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

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

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

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 APS Invest One and its Contractor(s) are made aware of all stipulations within the EMPr.
- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully knowledgeable with the EIA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

Site Manager (APS Invest One's on-site Representative) will:

- » Be fully knowledgeable with the contents of the EIA and risk management.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the EMPr.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMPr and its implementation.
- » Conduct audits to ensure compliance to the EMPr.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » 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 APS Invest One 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 EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the EIA.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the EMPr.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMPr 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 EMPr.
- » 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 EMPr 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, EMPr 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 EMPr. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

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

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

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

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

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

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

6.2 Objectives

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

a) OBJECTIVE: Minimise impacts related to inappropriate site establishment

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. PV panels, and substation). » Linear infrastructure (i.e. power line, and access roads).
Potential Impact	<ul style="list-style-type: none"> » Hazards to 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	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	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

Mitigation: Action/Control	Responsibility	Timeframe
		of construction
The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
The construction camp used to house equipment must be located in a disturbed area and must be screened as far as practical during the entire construction phase.	Contractor	Erection: 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 unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape).	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.	Contractor	Site establishment, and duration of construction
Supply adequate waste collection bins at site where construction is being undertaken. Separate labelled bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction
Sites for storing, mixing, and handling topsoil piles (if necessary) or any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 500 m from any type of wetland. Such sites must be clearly indicated in site plans and the drafting of relevant detailed method statements and/or	Contractor	Design Phase

Mitigation: Action/Control	Responsibility	Timeframe
management plans requested from the relevant contractor or environmental firm.		

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

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

The construction phase of the PV facility is expected to extend over a period of 16 months. This will however be dependent on the skills availability in the area. Workers not residing in the area, including those required for skilled positions will be transported to site on a daily basis and will not be housed on site. However, the security team will be required on site at all times.

It is expected that all construction staff will reside within existing accommodation in nearby townships. No staff should be accommodated on site. Construction equipment and machinery may need to be stored at an appropriate location on the site for the duration of the construction period, and temporary staff facilities will have to be made available.

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

	are stored or handled.
Mitigation:	» To minimise impacts on the biophysical environment
Target/Objective	» To prevent any residual or cumulative impacts arising from temporary construction or storage areas

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » The location of the construction equipment camp and all access routes will take cognisance of any ecologically sensitive areas identified. » The location of this construction equipment camp must be approved by the project ECO or the specialist doing the pre-commencement footprint investigation, and must be agreed with the affected landowner. 	Contractor	Pre-construction
No temporary site camps will be allowed outside the footprint of the development area.	Contractor	Construction
To minimise the footprint, temporary storage of equipment and materials on site should be kept at a minimum	Contractor	Construction
As far as possible, minimise natural and semi-natural vegetation clearing for equipment storage areas. Aim to locate the temporary construction camps on already degraded and/or heavily disturbed areas.	Contractor	Site establishment
Staff must be supplied with adequate facilities aimed at preventing any kind of pollution.	Contractor	Construction
Cooking on open fires must be prohibited, if staff need cooking/kitchen facilities on site, such should be provided by the contractor	Contractor	Construction
<ul style="list-style-type: none"> » Identify and demarcate construction areas, servitudes, and access for general construction work and restrict construction activity to these areas. » Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling) » Create specific turning points and parking areas for vehicles and heavy machinery as needed » Strictly prohibit any driving outside designated areas and roads 	Contractor	Before and during construction
To limit the possible distribution of undesirable species and possible pollutants onto site: <ul style="list-style-type: none"> » Regularly check clothing and vehicles for mud and seed and clear in an appropriate manner » Do not wash down any machinery or vehicle within 	Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
the farm portion, including the footprint area » All materials moved onto the development site must be free of weeds or any other undesirable organisms or pollutants » It is recommended that fuels, lubricants and other chemicals only be stored on site if absolutely necessary, and then in a manner that prevents any accidental spillage		
Rehabilitate and re-vegetate all disturbed areas at the construction equipment camp as soon as construction is complete within an area and mitigate erosion where required as per specific management plans	Contractor, rehabilitation contractor	Construction, operational phase

Performance Indicator	» No visible erosion scars or any pollution once construction in an area is completed » All damaged areas successfully rehabilitated one year after completion » No damage to drainage lines or other types of water resource areas » Appropriate waste management
Monitoring	» Regular monitoring and audits of the construction camps and temporary structures on site by the ECO » A photographic record must be established before, during and after mitigation » An incident reporting system must be used to record non-conformances to the EMP, followed by the necessary action from the developer to ensure full compliance

c) 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 solar energy facility, including infrastructure etc.
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Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activity/risk source	The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
Mitigation: Target/Objective	The proponent, in discussions with the MLM, should aim to employ the majority of the low-skilled workers from the local area where possible. This should also be made a requirement for all contractors. The proponent should also develop a database of local BBBEE service providers

Mitigation: Action/control	Responsibility	Timeframe
Aim for the majority of the low-skilled workers are sourced from the local area.	APS Invest One & contractors	Preconstruction/ construction
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase.	APS Invest One & contractors	Preconstruction/ construction
Skills audit to be undertaken to determine training and skills development requirements.	APS Invest One & contractors	Preconstruction/ construction
Develop a database of local BBBEE service providers and ensure that they are informed of tenders and job opportunities.	APS Invest One & contractors	Preconstruction/ construction
Identify potential opportunities for local businesses	APS Invest One & contractors	Preconstruction/ construction

Performance Indicator	<ul style="list-style-type: none"> » Employment and business policy document that sets out local employment and targets completed before construction phase commences; » Majority of semi and unskilled labour locally sourced where possible. » Database of potential local BBBEE 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	<ul style="list-style-type: none"> » The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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

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

Other possible negative impacts due to the workforce's presence in the area and especially when jobseekers come to the area would include misconduct of workers, trespassing of workers on privately-owned farms, the possible increase in crime, littering, increase in traffic, increase in noise, the development of informal vending stations, and poaching of livestock.

Project component/s	Construction and establishment activities associated with the establishment of the solar energy facility, including infrastructure etc.
Potential Impact	The presence of construction workers who live outside the area and who are housed in local towns can impact on family structures and social networks.
Activity/risk source	The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.
Mitigation: Target/Objective	To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.

Mitigation: Action/control	Responsibility	Timeframe
The majority of the low-skilled workers should be sourced from the local area. This should be included in the tender documents. Construction workers should be recruited from the local area in and around the Upington area.	APS Invest One & contractors	Pre-construction/ construction
Identify local contractors who are qualified to undertake the required work.	APS Invest One & contractors	Pre-construction/ construction
Consider establishment of a Monitoring Forum (MF) consisting of representatives from the local community, local police, local farming community and the contractor prior to the commencement of the construction phase.	APS Invest One & contractors	Pre-construction/ construction
Develop a Code of Conduct to cover the activities of the construction workers housed on the site.	APS Invest One & contractors	Pre-construction/ construction

Mitigation: Action/control	Responsibility	Timeframe
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.	APS Invest One & contractors	Pre-construction/ construction
Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	APS Invest One & contractors	Pre-construction/ construction
Ensure that construction workers who are found guilty of breaching the Code of Conduct are disciplined accordingly. All disciplinary hearings and/or dismissals must be in accordance with South African labour legislation.	APS Invest One & contractors	Construction
Provide opportunities for workers to go home over weekends.	APS Invest One & contractors	Construction
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.	APS Invest One & contractors	Construction

Performance Indicator	<ul style="list-style-type: none"> » Employment policy and tender documents that sets out local employment and targets completed before construction phase commences. » Majority of semi and unskilled labour locally sourced where possible. » Construction workers employed have proof that they have lived in the area for five years or longer. » 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	<ul style="list-style-type: none"> » The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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

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

Access to the development site is afforded by means of a 2.3km stretch of existing secondary (gravel) road that joins the N14 national road near the small town of Klippunt, supplemented by another approximately 3km of new roads to each of the project phases.

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

Project Component/s	<ul style="list-style-type: none"> » Delivery of any component required within the construction phase.
Potential Impact	<ul style="list-style-type: none"> » Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix concrete from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Power line and substation construction activities.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise impact of traffic associated with the construction of the facility on local traffic volume, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between

	<p>pedestrians or sensitive users and traffic associated with the facility construction</p> <p>» To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions</p>
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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.	APS Invest One & contractors	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	Contractor	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor	Construction
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

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

f). OBJECTIVE: Effective management of concrete batching plants

Concrete is required during the construction of the solar energy facility. There could be a need to establish a batching plant within the site. Batching plants are facilities/installations that combine various ingredients to form concrete. Some of these inputs include sand, water, aggregate (rocks, gravel, etc.), fly ash, potash, and cement.

Turbid and highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. Concrete batching plants, cement, sand and aggregates can produce dust. Potential pollutants in batching plant wastewater and stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	<ul style="list-style-type: none"> » Batching plant and associated activities
Potential Impact	<ul style="list-style-type: none"> » Dust emissions » Release of contaminated water » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste

	generation
Activity/risk source	<ul style="list-style-type: none"> » Operation of the batching plant » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

Mitigation: Action/control	Responsibility	Timeframe
Where possible concrete batching plants should be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised	Contractor	Construction phase
The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant.	Contractor	Construction phase
Where there is a regular movement of vehicles, access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment	Contractor	Construction phase
The concrete batching plant site should demonstrate good maintenance practices, including regular sweeping to prevent dust build-up.	Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	Contractor	Construction phase
Water sprays or a dust suppression agent should be correctly applied to reduce dust emissions from aggregate material.	Contractor	Construction phase
Conveyors must be designed and constructed to prevent fugitive dust emissions. This may include covering the conveyor with a roof, installing side protection barriers and equipping the conveyor with spill trays, which direct material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	Contractor	Construction phase
The site should be designed and constructed such that clean stormwater, including roof runoff, is diverted away from contaminated areas and directed to the stormwater discharge system.	Contractor	Construction phase
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation	Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
Contaminated stormwater and process wastewater should be captured and recycled where possible. A wastewater collection and recycling system should be designed to collect contaminated water.	Contractor	Construction phase
Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control	Contractor	Construction phase
Ensure that all practicable steps are taken to minimise the adverse effect that noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms	Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction phase
Empty cement bags should be collected and disposed appropriately.	Contractor	Construction phase

Performance Indicator	<ul style="list-style-type: none"> » No complaints on dust » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » 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 » 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 » Developer or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase

g) 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 solar energy 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.
Activity/risk source	The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may also 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
The housing of construction workers on the site should be limited to security personnel.	APS Invest One & contractors	Pre-construction/ construction
Establish a MF with the adjacent farmers and develop a Code of Conduct for construction workers.	APS Invest One & contractors	Pre-construction/ construction
Inform all workers of the conditions contained in the Code of Conduct.	Contractor	Pre-construction/ construction
Discipline all workers that do not adhere to the code of conduct for workers. All disciplinary hearings and any dismissals must be in accordance with South African labour legislation.	Contractor	Pre-construction/ construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractor	Pre-construction/ construction

Performance Indicator	» Community MF in place before construction phase commences.
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	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

h) OBJECTIVE: To avoid and/or minimise the potential negative impact on current and future farming activities during the construction and operational phase.

Construction and operational activities of the proposed facility could lead to the loss of productive farm land. This could be either due to extensive loss of topsoil, soil seed banks, natural vegetation, erosion, or pollution. An open space management plan be drafted in addition to all other management plans related to ecosystem integrity to ensure the safeguarding of the lands productivity and the functionality of the ecosystem on and beyond the development site.

Project component/s	<ul style="list-style-type: none"> » PV Array » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Temporary construction camps » Protective fencing around development » Potential topsoil stockpiles and/or borrow pits
Potential Impact	<ul style="list-style-type: none"> » The footprint of the developments will result in a loss of land that will impact on current farming activities on the site » Within the footprint, a change of plant species composition with lower productivity and agricultural potential can be expected due to removal, disturbance and continued long-term shading of vegetation » A largely reduced vegetation cover will render the ecosystem more prone to erosion and irreversible degradation » Disturbance of indigenous vegetation creates opportunities for the establishment of invasive vegetation or creation of surfaces that do not support the permanent (re-) establishment of vegetation
Activities/risk sources	<ul style="list-style-type: none"> » The footprint taken up by the development » Clearing of vegetation and landscaping on footprint area » Introduction and/or further distribution of invasive plant species » Excessive fragmentation of habitats

	» Accelerated erosion with extensive loss of topsoils and associated natural seedbanks and nutrients
Mitigation: Target/Objective	» To minimise the loss of land and desirable indigenous vegetation by the construction of the development and to enable selected farming activities (e.g. grazing by small livestock) to continue where possible

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Minimise the footprint of the development where possible, at the same time avoid impacting on sensitive habitats » The footprint for <i>all</i> development components should be defined before the construction phase commences » The site-specific EMPr to be updated after the walk-through of the final footprint shall provide for the mitigation of the impacts of the different types of development components, e.g. if topsoil will have to be stored, a topsoil management plan will have to be drafted * Note: topsoil shall at all times be treated as a valuable agricultural resource 	Contractor and relevant specialists	Before and during construction
<p>Rehabilitate disturbed areas on completion of the construction phase. Details of the rehabilitation programme should be contained in the relevant EMPr.</p> <ul style="list-style-type: none"> » Rehabilitation targets must be set according to the original vegetation as described in the ecological specialist report 	Contractor, rehabilitation specialist	On-going during construction phase
Monitor erosion and manage all occurrences according to the erosion management plan	Contractor	On-going, from construction to de-commissioning
<ul style="list-style-type: none"> » Eradicate all weeds and alien invasive plants as far as practically possible » Continually monitor the re-emergence of these species and manage according to the invasive species management plan 	Contractor	On-going, from construction to de-commissioning

Performance Indicator	<ul style="list-style-type: none"> » Final footprint of development components included in the final Construction Phase EMPr » All relevant and specific EMPrs also agreed upon by the land owner and then diligently implemented by the contractor and developer » Stable vegetation cover throughout the development area as determined desirable to curb erosion and maintain ecosystem functionality
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Monitoring	<ul style="list-style-type: none"> » Regular monitoring and audits of construction activities and the footprint area by the ECO to prevent any degradation of the ecosystem » A photographic record must be established before, during and after mitigation » An incident reporting system should be used to record non-conformances to the EMPr, followed by the necessary action from the developer to ensure full compliance
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i) 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 solar energy facility, including infrastructure etc.
Potential Impact	Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activity/risk source	The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation: Target/Objective	To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and also minimise damage to roads.

Mitigation: Action/control	Responsibility	Timeframe
Implement dust suppression measures for heavy vehicles such as, for example, wetting roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Contractor	Pre-construction/ construction
Ensure that all vehicles are road-worthy, drivers are qualified and are made aware of the potential noise, dust and safety issues.	Contractor	Pre-construction/ construction
Ensure that drivers adhere to speed limits. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractor	Pre-construction/ construction
Ensure that any damage to roads is repaired before completion of construction phase.	Contractor	Pre-construction/ construction

Mitigation: Action/control	Responsibility	Timeframe
		construction
Performance Indicator	» Dust suppression measures implemented for all access roads that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.	
Monitoring	» The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.	

j) OBJECTIVE: Minimisation of development footprint and disturbance to topsoil

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

Removal of topsoil should be done where:

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

Topsoil must at all times be treated as a valuable natural resource, and may thus not be discarded or degraded. In many sections of the development area, topsoils are very shallow or rocky, which would make topsoil removal difficult. Grading in such areas should be kept as low as possible.

Project Component/s	Project components affecting the objective: » PV Array supports and trenching » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Potential topsoil stockpiles and/or borrow pits
Potential Impact	» Loss of topsoil and natural resources and biological activity within the topsoil » Loss of natural regeneration potential of soils » Loss of agricultural potential of soils.
Activity/Risk Source	» Site preparation and earthworks » Excavation of foundations and trenches » Construction of site access road

	<ul style="list-style-type: none"> » Power line construction activities » PV array construction activities » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To retain full biological activity and functionality of topsoil » To retain desirable natural vegetation, where possible » To minimise footprints of disturbance of vegetation/habitats » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas » Minimise spoil material

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary disturbance. » All woody material cleared must be shredded to coarse chips 	Contractor in consultation with Specialist	Pre-construction
Construction activities must be restricted to demarcated areas so that impact on topsoil is minimised.	Contractor	Before and during construction, operational phase
Salvaging topsoil: <ul style="list-style-type: none"> » Topsoil must always be salvaged and stored separately from subsoil and lower-lying parent rock or other spoil material. <ul style="list-style-type: none"> ○ Topsoil stripping removes up to 30 cm or less of the upper soils. ○ In cultivated areas, depth of topsoil may increase and needs to be confirmed with the land owner » Prior to salvaging topsoil the depth, quality and characteristics of topsoil should be known for every management area. <ul style="list-style-type: none"> * This will give an indication of total volumes of topsoil that need to be stored to enable the proper planning and placement of topsoil storage. * Different types of topsoil – rocky soils and sands or loams must be stored separately » Topsoil should be removed (and stored) under dry conditions to avoid excessive compaction whenever topsoil will have to be stored for longer than one year. 	Contractor	Before and during construction
Storing topsoil: <ul style="list-style-type: none"> » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. 	Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location if not adjacent to a linear development: <ul style="list-style-type: none"> * At least 50 m from any wetland or watering point * Ideally a disturbed but weed-free area » <i>Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower</i> <ul style="list-style-type: none"> * Place berms along contours or perpendicular to the prevailing wind direction * Adhere to the following general rule: the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored » Topsoil handling should be reduced to stripping, piling (once), and re-application. Between the stockpiling and reapplication, stored topsoil should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches <ul style="list-style-type: none"> * In such case, use one side of the linear development for machinery and access only * Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile) * If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: <ul style="list-style-type: none"> * Preventing puddling on or between heaps of topsoil * Or covering topsoil berms * Preventing all forms of contamination or pollution * Preventing any form of compaction * Monitoring establishment of all invasive vegetation and removing such if it appears * Keeping slopes of topsoil at a maximal 2:1 ratio 		

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> * Monitoring and mitigating erosion where it appears * Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered 		
<p>Reapplying topsoil:</p> <ul style="list-style-type: none"> » Spoil materials and subsoil must be back-filled first, then covered with topsoil <ul style="list-style-type: none"> ○ It is recommended that where feasible, spoil materials be used to fill in and close old mine pits in the development area that currently pose a great safety risk to man and animals » Generally, topsoil should be re-applied to a depth equal to slightly greater than the topsoil horizon of a pre-selected undisturbed reference site » The minimum depth of topsoil needed for revegetation to be successful is approximately 20 cm » If the amount of topsoil available is limited, a strategy must be worked out to optimise revegetation efforts with the topsoil available » Reapplied topsoil should be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture levels where the seeds are likely to be more concentrated. This greatly improves the success rate of revegetation efforts. » To stabilise reapplied topsoils and minimise raindrop impact and erosion: <ul style="list-style-type: none"> ○ Use organic material from cleared and shredded woody vegetation where possible ○ Alternatively, suitable geotextiles or organic erosion mats can be used as necessary » Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation 	Contractor	Before and during construction
<p>Re-applied topsoil needs to be re-vegetated as soon as possible, following the specifications of the revegetation and rehabilitation plan.</p>	Contractor	Before and during construction, monitored during operational phase

Performance Indicator	<ul style="list-style-type: none"> » Minimal disturbance outside of designated work areas. » Topsoil appropriately stored, managed, and rehabilitated.
Monitoring	<ul style="list-style-type: none"> » Monitoring of appropriate methods of vegetation clearing and soil management activities by ECO throughout construction phase. » An incident reporting system will be used to record non-conformances to the EMPr. » Regular monitoring of topsoil after construction by developer until such topsoil can be regarded as fully rehabilitated, stable and no longer prone to accelerated erosion

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

Prior to commencement of any activity, including earthworks (grading, road construction, etc.) within areas of natural vegetation a plant Search and Rescue program should be developed and implemented, preceded by a meticulous investigation of all footprint areas by a suitably qualified botanist, conducted during the optimal growing season (January to March) along the entire footprint area.

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

Mitigation: Action/Control	Responsibility	Timeframe
Ecological footprint investigation and recording by GPS of localities of all red data species and indication of presence of other species of conservation concern	Ecologist	Prior to commencement of activity
» Search and Rescue (S&R) of all protected plants	Horticultural	Prior to

Mitigation: Action/Control	Responsibility	Timeframe
<p>that will be affected by the development, especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place.</p> <ul style="list-style-type: none"> * The necessary permits must be in place » Plants that can be considered for rescue and included in subsequent rehabilitation programs are all tubers, bulbs, and indigenous succulents » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately or bagged (or succulents left to first air-dry before planting) and kept in the horticulturist's or a designated on-site nursery, and should be returned to site or land portion once all construction is completed and rehabilitation of disturbed areas is required. » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment. 	/Contractor	construction
<p>In line with specifications regarding permissible biodiversity and the rehabilitation plan a minimum percentage cover of vegetation must be established and permanently maintained post construction</p>	Developer and horticultural contractor	After construction, throughout operational phase
<p>All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity.</p> <ul style="list-style-type: none"> » The trenches must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed in a safe manner, unharmed, and placed in an area where the animal will be comfortable. » If the ECO or contractor is unable to assist in the movement of a fauna species, ensure a member of the conservation authorities assists with the translocation. » All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either be put down in a humane manner or cared for until it can be released again 	Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Note: Excavated material that needs to be discarded should be used to fill up and permanently close the old mine pits on the property		

Performance Indicator	<ul style="list-style-type: none"> » Rescue and relocation of species of conservation concern » No damage or injury to fauna » Re-establishment of rescued species
Monitoring	<ul style="list-style-type: none"> » ECO to monitor Search and Rescue, continue search and rescue operations during the construction process where it becomes necessary after the initial S&R » It may be possible that geophytic species may emerge during construction that were not accounted for in the original S&R plan – once observed the ECO should consult the botanists on the identification and possible S&R for those plant species

I) OBJECTIVE: Minimising the impact on Heritage sites

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Surface collection of LSA microliths by interested tertiary institutions before construction	Specialist	Duration of construction
Periodic monitoring of excavation activities during the construction period to ensure that no sub-surface deposits are missed.	Specialist	Duration of construction

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

m) OBJECTIVE: Mitigating disturbance or loss of the natural vegetation

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 activity that could result in a disturbance or loss of the natural vegetation, e.g. construction of panel infrastructure, access roads, substation and power line.
Potential Impact	Disturbance or loss of indigenous vegetation during the construction and operational phases results in a loss of biodiversity and habitat, increases declared weedy and alien invasive plant species and soil erosion; and disrupts natural faunal populations.
Activity/Risk Source	Construction and operational phases.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise loss and disturbance of natural vegetation. » Re-vegetate denuded and disturbed areas as soon as possible. » Monitor and control declared weeds and invader species. » Time period: Construction and operational phases.

Mitigation: Action/Control	Responsibility	Timeframe
Minimise large-scale clearance of natural vegetation and disturbance to the proposed site.	Contractor	Duration of construction
Use existing and dedicated access roads to limit disturbance of the natural vegetation.		
Minimise damage to natural vegetation beyond the site during the construction of the power line and access road.		
Re-vegetate disturbed areas as soon as possible after construction.		
Prevent soil erosion originating from the site.		
Monitor and control declared weeds and invader species		

Performance Indicator	» Minimal loss or disturbance of natural vegetation in and around the site.
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	<ul style="list-style-type: none"> » Vehicles drive on dedicated roads with no disturbance of the surrounding natural vegetation. » Damage to the natural vegetation is minimised during the construction of associated infrastructure such as the power line and access roads. » Construction site should be clearly demarcated and construction should be restricted to this area. Existing and dedicated roads should be clearly marked and only those roads utilised by vehicles. Power line placement and construction should limit disturbance to the natural vegetation.
Monitoring	<ul style="list-style-type: none"> » The Environmental Control Officer should monitor and report to the Environmental Authorities as to whether the construction is contained within these boundaries and that the surrounding natural vegetation has not been negatively affected. » During the operational phase, activities should be restricted to the developed site and associated infrastructure

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

Within the project area invasive species – indigenous and alien - occur, which all have a potential of reproducing to such an extent that the ecosystem within and beyond the project area could be impaired. Additional alien species grow along major transport routes to the area and thus could be potentially spread there as well.

Indigenous invasive species that need to be controlled:

- » *Acacia mellifera* subsp. *mellifera*, *Rhigozum trichotomum*

Alien invasives that must be controlled and eradicated to prevent degradation:

- » *Salsola kali*

Weeds and potentially invasive species on and around the site that need to be monitored and managed:

- » *Prosopis* sp, *Nicotiana glauca*, *Melia azedarach*, *Tribulus terrestris*

Project Component/s	<ul style="list-style-type: none"> » Permanent and temporary infrastructure » Access roads
Potential Impact	<ul style="list-style-type: none"> » Impacts on natural vegetation » Impacts on soil » Impact on faunal habitats » Degradation and loss of agricultural potential

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

Mitigation: Action/Control	Responsibility	Timeframe
Compile a detailed invasive plant management and monitoring programme as guideline for the entire construction, operational and decommissioning phase <ul style="list-style-type: none"> » This plan must contain WfW-accepted species-specific eradication methods » It must also provide for a continuous monitoring programme to detect new infestations 	Specialist	Pre-construction
Avoid creating conditions in which invasive plants may become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Shred all non-seeding material from cleared invasive shrubs and other vegetation an use as mulch as part of the rehabilitation and revegetation plan » Where possible, destroy seeding material of weeds and invasives by piling burning (in designated areas or suitable containers) » Do not import soil from areas with alien plants 	Contractor	Construction phase Operational phase
<ul style="list-style-type: none"> » Eradicate all invasive plants that occur within the development's temporary and permanent footprint areas » Ensure that material from invasive plants that can regenerate – seeds, suckers, plant parts are adequately destroyed and not further distributed 	Contractor	Construction phase Operational phase
<ul style="list-style-type: none"> » Immediately control any alien plants that become newly established using registered control measures 	Contractor	Construction phase Operational phase

Mitigation: Action/Control	Responsibility	Timeframe
Risks from alien invasives do not only arise from invasives present within the footprint area, but also from alien invasives along the verges of the major transport routes, especially invasive grasses and smaller weeds. Similarly, invasives can be spread by construction processes to surrounding areas. To avoid the distribution of weeds and invasive plants, establish a routine amongst contractors/all staff to regularly check: <ul style="list-style-type: none"> » that clothing and shoes are free of mud and seeds » that foot wells inside vehicles and mats are cleared of weed seed » radiator and grill, along wheel trims, around wheels, mud flaps, undercarriage of vehicle or other moving machinery for mud and seed 	Contractor	Construction phase Operational phase

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

o) OBJECTIVE: Minimise soil degradation and erosion (Erosion management Plan)

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

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

The measures below indicate the minimum mitigation that will be required for erosion and stormwater control. A more specific erosion management plan will be possible after the final layouts and choice of PV array components are known.

Project Component/s	<ul style="list-style-type: none"> » PV Array » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Potential topsoil stockpiles and/or borrow pits
Potential Impact	<ul style="list-style-type: none"> » Loss of topsoil and natural resources and biological activity within the topsoil » Loss of natural regeneration potential of soils » Loss of agricultural potential of soils.
Activity/Risk Source	<ul style="list-style-type: none"> » Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Concentrated discharge of water from construction activity and new infrastructure » Storm water run-off from sealed, altered or bare surfaces » Construction equipment and vehicle movement on site » Cabling and road construction activities » Power line construction activities » Roadside drainage ditches » Premature abandonment of follow-up monitoring and adaptive management of rehabilitation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise erosion of soil from site during construction » To minimise deposition of soil into drainage lines » To minimise damage to vegetation by erosion or deposition » To minimise damage to rock, soil, animals and vegetation by construction activity » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover » No reduction in the surface area of natural drainage lines and other wetland areas as a result of the establishment of infrastructure » Minimal loss of vegetation cover due to construction related activities » No increase in runoff into drainage lines as a result of construction of project related infrastructure » No increase in runoff into drainage lines as a result of road construction

Mitigation: Action/Control	Responsibility	Timeframe
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity	Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
within construction areas (prevent over-excavations and double handling)		
New access roads and other servitudes to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil. Special attention to be given to roads and tracks that cross drainage lines.	Contractor	Before and during construction
Rehabilitate disturbance areas as soon as construction in an area is completed as per the rehabilitation plan.	Contractor	Immediately after construction, monitored during operational phase
<p>General Erosion control measures:</p> <ul style="list-style-type: none"> » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas <ul style="list-style-type: none"> ○ Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water. » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. » Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction. » Storm water and any runoff generated by hard impervious surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. » Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion. 	Contractor	Construction, operational phase

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation. » Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment » If implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water 		
Control depth of excavations and stability of cut faces/sidewalls	Contractor	Site establishment & duration of contract
Compile a comprehensive storm water management method statement, as part of the final design of the project and implement during construction and operation.	APS Invest One	Site establishment & duration of contract
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	Contractor	Construction phase Operational phase, monitored throughout
All vehicles on site must be appropriate to access the site. No off-road driving is permitted unless authorised by the ECO.	Contractor	Pre-construction, Construction & operation
4x4s or diff lock vehicles must be used in wet slippery conditions to reduce the erosion on the roads and the surrounding area.	Contractor	Pre-construction, Construction & operation

Performance Indicator	<ul style="list-style-type: none"> » Minimal level of soil erosion around site » Minimal level of increased siltation in drainage lines or pans » Minimal level of soil degradation » Acceptable state of excavations, as determined by EO & ECO » Progressive return of disturbed and rehabilitated areas to the desired end state (Refer also to the Plant Rescue and Rehabilitation Plan)
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Monitoring	<ul style="list-style-type: none"> » Fortnightly inspections of the site by ECO » Fortnightly inspections of sediment control devices by ECO » Fortnightly inspections of surroundings, including drainage lines by ECO » Immediate reporting of ineffective sediment control systems » An incident reporting system must record non-conformances according to the EMPr.
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p) OBJECTIVE: The mitigation and possible negation of the additional visual impacts associated with the construction and operation of the solar energy facility.

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

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

Mitigation: Action/control	Responsibility	Timeframe
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Contractor	Construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Contractor	Project planning
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in	Contractor	Project planning

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

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

q). 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 B** of this EMPr.

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

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	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	Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
legislative requirements, including the use of licensed contractors.		contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be 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	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » A complaints register 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 EMPr.

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

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

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	» 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

Mitigation: Action/Control	Responsibility	Timeframe
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface. 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	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	<ul style="list-style-type: none"> » Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances. » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any

- complaints from the community will be logged.
- » An incident reporting system will be used to record non-conformances to the EMPr.

s) 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 solar energy facility, including infrastructure etc.
Potential Impact	Grass 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.
Activity/risk source	The presence of construction workers and their activities on the site can increase the risk of grass fires.
Mitigation: Target/Objective	To avoid and or minimise the potential risk of grass 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.	Contractor	Construction
Provide adequate fire fighting equipment onsite.	Contractor	Construction
Provide fire-fighting training to selected construction staff.	Contractor	Construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Designated areas for fires identified on site at the outset of the construction phase. » Fire fighting equipment and training provided before the construction phase commences. » Proven compensation claims settled within 1 month of claim being verified by Community MF.
Monitoring	<ul style="list-style-type: none"> » The proponent 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

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

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

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

- » 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 banded with a suitable collection point for accidental spills must be

implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).

- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (i.e.: removal to reintroduction or replanting, if necessary).
- » Rehabilitation and re-vegetation process.
- » Traffic management.
- » Incident and accident reporting protocol.
- » General administration (and stipulating that all documentation and licences must be on site at all times).
- » Designate access road and the protocol on while roads are in use.
- » Requirements of gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the APS Invest One Construction Manager /Project Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

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

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

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

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

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 EMPr 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

a) OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr 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, APS Invest One 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 EMPr, 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 EMPr.

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:

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

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

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

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitation of surface		
Prior to the application of topsoil <ul style="list-style-type: none"> » subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures » ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper or by hand to a depth of 15 – 20 cm » compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil » any foreign objects, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place » shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes 	Contractor, ECO to control	During and after construction
Application of topsoil <ul style="list-style-type: none"> » topsoils shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed » the final prepared surface shall not be smooth but furrowed to follow the natural contours of the land » the final prepared surface shall be free of any pollution or any kind of contamination 	Contractor, ECO to control	During and after construction

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » care shall be taken to prevent the compaction of topsoil 		
<p>Soil stabilisation</p> <ul style="list-style-type: none"> » mulch, if available from shredded vegetation, shall be applied by hand to achieve a layer of uniform thickness » mulch shall be rotovated into the upper 10 cm layer of soil <ul style="list-style-type: none"> * this operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil » measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible <ul style="list-style-type: none"> * where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed » additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas » runnels or erosion channels developing shall be back-filled and restored to a proper condition <ul style="list-style-type: none"> o such measures shall be effected immediately before erosion develops at a large scale » where erosion cannot be remedied with available mulch or rocks, geojute or other geotextiles shall be used to curtail erosion 	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
<p>Borrow-pits (if required)</p> <ul style="list-style-type: none"> » shall be shaped to have undulating, low-gradient slopes and surfaces that are rough and irregular, suitable for trapping sediments and facilitation of plant growth » upon completion of rehabilitation these reshaped and revegetated areas shall blend into the natural terrain 	Contractor, ECO to control	After construction
Revegetation		
<ul style="list-style-type: none"> » revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoils could be re-applied within 6 months » revegetation will be done according to an approved planting/landscaping plan according to the desirable end states and permissible vegetation 	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
Re-seeding	Contractor, ECO	Construction

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

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

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

MANAGEMENT PROGRAMME: OPERATION

CHAPTER 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 EMPr.

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

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

The **Power Station Manager** will:

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

The **Environmental Manager** will:

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

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

8.2. Objectives

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

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

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

Project component/s	<ul style="list-style-type: none"> » Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequent rehabilitation at its completion. » Areas where the natural microclimate and thus vegetation composition has changed due to structures such as PV panels erected.
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Movement of employee vehicles within and around site. » Excessive shading by PV panels. » Altered rainfall interception and resultant runoff patterns by infrastructure.

Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.
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Mitigation: Action/Control	Responsibility	Timeframe
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Operator	Operation
An on-going invasive and alien plant monitoring and eradication programme must be implemented, where necessary	Operator	Operation
In line with specifications regarding permissible biodiversity and the rehabilitation plan, a minimum percentage cover of vegetation must be established and permanently maintained post construction	Developer and horticultural contractor	After construction, throughout operational phase

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

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

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

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

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

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

The soil on site may be impacted in terms of:

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Operator	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	Operator	Operation
Develop and implement an appropriate stormwater management plan for the operational phase of the facility	Operator	Operation

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

d) OBJECTIVE: Minimise dust and air emissions

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

Project Component/s	<ul style="list-style-type: none"> » Hard engineered surfaces. » On-site vehicles.
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO₂,

	CO and SO ₂) from vehicles and the augmentation plant.
Activities/Risk Sources	<ul style="list-style-type: none"> » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

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

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

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

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

Project Component/s	» Operation and maintenance of the solar energy facility and associated infrastructure.
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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.	APS Invest One/ Operator	Operation
Provide adequate fire fighting equipment on site.	APS Invest One/ Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Operator	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Operator	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	APS Invest One/ Operator	Operation
Contact details of emergency services should be prominently displayed on site.	Operator	Operation

Performance Indicator	» Fire fighting equipment and training provided before the operational phase commences. » Appropriate fire breaks in place and maintained.
Monitoring	» APS Invest One must monitor indicators listed above to ensure that they have been met.

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

The facility is expected to be operational for more than 20 – 25 years during which time approximately 120 staff members are expected to be required on-site. Therefore, long-term direct job opportunities for locals could exist, although limited. However, in an area with such high unemployment figures, these limited

opportunities can still be seen as a positive impact on the quality of life of those benefiting from the employment.

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

Project Component/s	» Day to day operational activities associated with the PV facility, including maintenance etc.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised
Activities/Risk Sources	» The operational phase of the PV facility will create approximately 120 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 120 permanent staff is likely to be based in Upington. APS Invest One should commit to implementing a 5-year training and skills development and training programme to maximise employment for locals.	APS Invest One	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.	APS Invest One	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	» APS Invest One must monitor indicators listed above to ensure that they have been met for the operational phase.

g) OBJECTIVE: Appropriate handling and management of waste

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

Project Component/s	<ul style="list-style-type: none"> » Substation. » Operation and maintenance staff. » Workshop.
Potential Impact	<ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	<ul style="list-style-type: none"> » Transformers and switchgear for the substations. » Ancillary buildings.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

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.	APS Invest One/ Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	APS Invest One/ Operator	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Operator	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 banded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Operator	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Operator	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Operator/ waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Operator/ waste management contractor	Operation
Used oils and chemicals:	Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority » Waste must be stored and handled according to the relevant legislation and regulations 		
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Operator	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Operator	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Operator	Operation

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

MANAGEMENT PROGRAMME: DECOMMISSIONING

CHAPTER 9

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

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

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 Remove Infrastructure

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

9.3 Objectives

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

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

Project Component/s	» Decommissioning phase of the PV facility and associated infrastructure
Potential Impact	» Decommissioning will result in job losses, which in turn can

	result in a number of social impacts, such as reduced quality of life, stress, depression etc. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/Risk Source	» Decommissioning of the PV facility
Mitigation: Target/Objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV facility.

Mitigation: Action/control	Responsibility	Timeframe
Retrenchments should comply with South African Labour legislation of the day	APS Invest One	When PV facility is decommissioned

Performance Indicator	» South African Labour legislation relevant at the time
Monitoring	» APS Invest One and Department of Labour

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

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

Mitigation: Action/control	Responsibility	Timeframe
Remove infrastructure not required for the post-decommissioning use of the site.	APS Invest One/ operator	During the decommissioning phase.
Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.	APS Invest One/ operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when	APS Invest One/ operator	Post decommissioning.

Mitigation: Action/control	Responsibility	Timeframe
required.		

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

FINALISATION OF THE EMPr

CHAPTER 10

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMPr 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 be 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 be 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 summarizes 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:
GUIDELINES FOR INTEGRATED MANAGEMENT OF
CONSTRUCTION WASTE**

GUIDELINE FOR INTEGRATED MANAGEMENT OF CONSTRUCTION WASTE

Waste is defined in the National Environmental Management: Waste Act (Act No 59 of 2008) as follows:

"any substance, whether or not that substance can be reduced, re-used, recycled and recovered:

- (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;*
- (b) which the generator has no further use of for (he purposes of production;*
- (c) that must be treated or disposed of; or*
- (d) that is identified as a waste by the Minister by notice in the Gazette,*

and includes waste generated by the mining, medical or other sector, but—

- (i) a by-product is not considered waste; and*
- (ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste"*

An integrated approach to waste management on site is needed. Such an approach is illustrated in the figure below.

The Integrated Waste Management Approach to Waste



Source: <http://www.enviroserv.co.za/pages/content.asp?SectionId=496>

1. Waste Assessment

A detailed waste assessment is necessary to understand the waste types and volumes being produced. In order to achieve this, construction practices must be measured and analysed.

2. Waste Plan

A waste plan must be developed to provide appropriate solutions for managing the entire waste stream on site. The objective of the plan should be to reduce the volumes of waste to disposal and thereby to reduce the cost of management of the waste stream without compromising environmental standards. The plan should include recovery, re-use and recycle recommendations.

Construction Waste Management is the practice of reducing the actual waste that goes to the landfill site. Waste reduction is best met by recycling, and construction wastes offer several opportunities in this regard. In fact, 80% of the wastes found in construction waste piles are recyclable in some form or another. Wood, concrete, bricks, metals, glass and even paint offer several options for recycling.

There are three basic steps for construction waste management, i.e. Reduce, Reuse, and Recycle. **Reduce** is the prevention of the waste from arising and optimising material usage. Waste avoidance and waste reduction can be achieved through improved education and training - by improving efficiencies and by making staff environmentally aware.

Reuse is using existing materials instead of throwing these away. Reusing does not mean that it needs to be reused on the same construction site. Selling or donating waste materials to a third party is one option of construction waste management.

Recycle is somewhat limited since it only allows for those items that can be used on-site. The most important step for recycling of construction waste is on-site separation. Initially, this will take additional effort and training of construction personnel. Targets should be set for the levels of recycling. Once separation habits are established, on-site separation can be done at little or no additional cost.

3. What to Recycle

Before recycling construction waste, identify who will accept it. This is important in designating type of waste to separate, and in making arrangements for drop-off or delivery of materials. Materials that can be recycled include:

- » Cardboard and Paper
- » Wood

- » Metals
- » Plastics
- » Glass
- » Paints, Stains, Solvents and Sealants
- » Oil

4. Materials Separation

Successful recycling requires good clean uniform collections of single waste types. This is most effectively achieved by separating the waste streams close to source rather than at the landfill site. Containers for material recycling must be set up on site and clearly labelled. Construction personnel must be trained in material sorting policy, and bins must be monitored periodically to prevent waste mixing as a result of construction employees throwing rubbish into the bins.

Some materials will require bins or storage that protect these from rain. Other bins may be locked to prevent tampering.

5. Recycling and Waste Minimisation Guidelines

- » *Wood*
 - * Optimise building dimensions to correspond to standard wood dimensions in order to reduce the need for cutting.
 - * Store wood on level blocking under cover to minimize warping, twisting and waste.
- » *Metals*
 - * During construction, separate metals for recycling, including copper piping, wire, aluminium, iron and steel, nails and fasteners, galvanized roofing. It is critical to keep lead out of landfills because it could leach into groundwater.
- » *Cardboard and Paper*
 - * Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.
 - * As far as possible, use recyclable packaging.
 - * Separate cardboard waste, bundle, and store in a dry place.
 - * Minimise the number of blueprints and reproductions necessary during the design and construction process.
- » *Plastic*
 - * Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.
 - * As far as possible, use recyclable packaging.

Since more than 60 different types of plastic resins exist, the Plastics Federation of South Africa has adopted a voluntary number coding system for each category of plastics to aid in their sorting by material type for recycling (Bruyns et al, 2002). The most common resin types are itemised in Table 1.

Table 1: Identification System for Plastic

Id Number	Plastic Resin Type
1	PET (polyethylene terephthalate)
2	HDPE (high-density polyethylene)
3	PVC (polyvinyl chloride) or V (vinyl)
4	LDPE (low-density polyethylene)
5	PP (polypropylene)
6	PS (polystyrene)
7	Other (laminates, etc.)

» *Paints, Stains, Solvents and Sealants*

- * Unused materials should be taken to a hazardous waste collection facility.

6. On-site Management

Good supervision of the waste management programme on site is critical to success. Management of the entire on-site program is critical to ensure smooth operations.

7. Auditing and Control

The success of the waste plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan. Finally, good record keeping and control, becomes a continuous waste assessment process, allowing the waste plan to be improved and adjusted as required.

8. Useful contacts:

<http://www.transpaco.co.za/page5.htm>

Transpaco, a manufacturing and distribution company operating extensively in the plastics and packaging industries, conducts plastic reclamation and recycling.

<http://www.jclenterprises.co.za/>

JCL Enterprises for plastic sales of quality recycled plastic materials as well as the recycling of plastic.

<http://www.rosefoundation.org.za/>

The Rose Foundation specialises in the collection and recycling of used motor (engine) oil.

Information Sources:

<http://www.greenbuilder.com/sourcebook/ConstructionWaste.html#Guidelines>

<http://www.enviroserv.co.za/pages/Content.asp?SectionID=587>

<http://www.enviroserv.co.za/pages/content.asp?SectionId=496>

Programme for the Implementation of the National Waste Management Strategy. DEAT,
May 2000

Residential Construction Waste Management Demonstration and Evaluation. Prepared
for U.S. Environmental Protection Agency by NAHB Research Center, May 2, 1995

APPENDIX C:
NORMS AND STANDARDS FOR STORAGE OF
WASTE

GOVERNMENT NOTICE

DEPARTMENT OF ENVIRONMENTAL AFFAIRS**No. 926****29 November 2013****NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008
(ACT NO. 59 OF 2008)****NATIONAL NORMS AND STANDARDS FOR THE STORAGE OF WASTE**

I, Bomo Edith Edna Molewa, Minister of Water and Environmental Affairs, in terms of section 7(1)(c) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), hereby set the national norms and standards for the storage of waste in the Schedule hereto for implementation.

**BOMO EDITH EDNA MOLEWA****MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS**

SCHEDULE

NATIONAL NORMS AND STANDARDS FOR THE STORAGE OF WASTE

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CHAPTER 1

INTERPRETATION, PURPOSE AND APPLICATION

1. Definitions

In this Schedule, unless the context indicates otherwise, any word or expression that is defined in the National Environmental Management: Waste Act, 2008 (Act No.59 of 2008) has the same meaning, and—

“Applicable legislation” includes, but is not limited to—

- (a) the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- (b) the National Environmental Management: Waste Act, 2008 (Act No.59 of 2008);

“Best environmental practice” means to perform or exercise a particular activity or activities in the most suitable, appropriate, advantageous or best advised manner in order to achieve the highest standards while performing or exercising such activity or activities;

“Colour coding” means the use of colour on a container or bag or the label attached to such, that serves to identify the category of waste that it contains;

“Constitution” means the Constitution of the Republic of South Africa, 1996

“General waste storage facility” means a storage facility that has a capacity to store in excess of 100m³ of general waste continuously;

“Ground water” means water that occupies pores in the soil and cavities and spaces found in the rocks which are situated in the saturated zone of the profile by rising from a deep magmatic source or by the infiltration of rainfall;

“Handling” means the functions associated with the movement of waste, including storage, treatment and ultimate disposal, by the use of manual systems and automated systems;

“Hazard” means the intrinsic potential property or the ability of any agent, equipment, material or process to cause harm;

“**Hazardous waste storage facility**” means a storage facility that has a capacity to store in excess of 80m³ of hazardous waste continuously;

“**Impermeable surface**” means a physical barrier or a membrane that prevents leaching of waste;

“**Monitoring**” means continuous or non-continuous measurement of a concentration or other parameters for purpose of assessment or control of environmental quality or exposure and the interpretation of such measurements;

“**Tank**” means a container designed for the accumulation of waste.

LIST OF ACRONYMS

CBO:Community Based Organization

DEA:Department of Environmental Affairs

NEMA: National Environmental Management Act, 1998(Act No. 107 of 1998)

NEM: WA: National Environmental Management: Waste Act, 2008(Act No.59 of 2008)

NGOs: Non Governmental Organizations

SEMA: Specific Environmental Management Acts

2. Purpose

- (1) The purpose of these norms and standards is to—
- (a) provide a uniform national approach relating to the management of waste storage facilities;
 - (b) ensure best practice in the management of waste storage facilities; and
 - (c) provide minimum standards for the design and operation of new and existing waste storage facilities.

3. Legislative Framework

- (1) The Constitution provides the foundation for environmental regulation and policy. Section 24 of the Constitution makes provision for environmental protection for the benefit of present and future generations and the right to an environment that is not harmful to health and well-being. This can only be achieved through a reasonable legislative framework and other measures that prevent pollution and ecological degradation, promote conservation, and secure ecologically sustainable development and the sustainable use of natural resources. The responsibility of ensuring a safe and healthy environment rests upon the State; reference can be made to the provisions of section 7(2) of the Constitution that reads "*The State must respect, protect and fulfill the bill of rights*". The DEA fulfills these rights through the application of the NEMA and the SEMAs among other tools.
- (2) The NEMA introduced a number of guiding principles into the South African environmental legislation, including the life-cycle approach to waste management, producer responsibility, the precautionary principle and the polluter pays principle. NEMA also places a duty of care on any person who causes significant pollution or degradation to the environment, requiring them to institute measures to prevent pollution from occurring, or to minimise and rectify the pollution or degradation where it cannot reasonably be avoided. The development of the norms and standards is the foundation of the regulatory system established in terms of section 7(1)(c) of the NEMA: WA.

4. Application

- (1) These norms and standards apply to any person who stores general or hazardous waste in a waste storage facility.
- (2) These facilities are required to comply with the norms and standards without a need to conduct a basic assessment and obtain a waste management licence as required by the Government Notice No. 718 of 3 July 2009.
- (3) The norms and standards do not apply to the storage of general or hazardous waste in surface impoundments or lagoons.

CHAPTER 2

REQUIREMENTS FOR WASTE STORAGE FACILITIES

Part 1

Registration, Location and Construction

5. Registration

- (1) A new waste storage facility must be registered with the competent authority within 90 (ninety) days prior to the construction taking place.
- (2) The applicant must provide at least the following information to be registered:
 - (a) Demarcation of the area where the storage facility will be located;
 - (b) Name of the waste storage facility;
 - (c) Name of the owner of the waste storage facility;
 - (d) Types of waste to be stored at the facility;
 - (e) Size of the storage facility;
 - (f) Sources of waste to be stored at the facility;

(g) Time frames for the storage of waste; and

(h) Geographical co-ordinates of the waste storage facility.

6. Location

- (1) In locating the waste storage facility consideration must be given to the public health and environmental protection. The location of the waste storage facility must also take into consideration the requirements in respect of existing servitudes.
- (2) A new hazardous waste storage facility must be located within an industrial demarcated zone. A storage facility that is not located within the industrial demarcated zone must have a buffer zone of at least 100m unless there is a prescribed buffer zone by the relevant municipality.
- (3) A general waste storage facility may be located within a residential area and must be located such that the facility is easily accessible by the public.
- (4) A waste storage facility must be located in such a manner that it can provide optimum handling and transportation of waste material.
- (5) The location of the hazardous waste storage facility must also take into consideration the hazards including the flammability and toxicity of the waste stored and applicable codes and standards.
- (6) A waste storage facility must be located in areas accessible by emergency response personnel and equipments.

7. Construction and Design

- (1) Construction and development of the waste storage facility must be carried out under the supervision of a registered professional engineer and must be in accordance with the approved civil engineering designs. The plan must only be amended and approved by a registered professional engineer.

- (2) The liquid waste storage area must have firm, impermeable, chemical resistant floors and a roof. Liquid waste containers that are not stored under a roofed area must be coated to prevent direct sunlight and rain water from getting in contact with the waste.
- (3) A hazardous waste storage facility must have impermeable and chemical resistant floors.
- (4) A liquid waste storage facility must be surrounded by an interception trench with a sump for intercepting and recovering potential spills and must be lined in compliance with the requirements set out in paragraph 7(2) of these standards.
- (5) A waste storage facility must be constructed to maintain on a continuous basis a drainage and containment system capable of collecting and storing all runoff water arising from the storage facility in the event of a flood. The system must under the said rainfall event, maintain a freeboard of half a meter.
- (6) A liquid waste storage area must have a secondary containment system (e.g. bund, drip tray) of a capacity which can contain at least 110% of the maximum contents of the waste storage facility. Where more than one container or tank is stored, the bund must be capable of storing at least 110% of the largest tank or 25% of the total storage capacity, whichever is greater (in the case of drums the tray or bund size must be at least 25% of total storage capacity).

Part 2

Management of Waste Storage Facilities

8. Access Control and Notices

- (1) A waste storage facility must have effective access control to prevent unauthorised entry. Weatherproof, durable and legible signs in at least 3 (three) official languages applicable in the area must be displayed at each entrance to the facility. The signs must indicate the risks involved in entering the site, hours of operation, the name, address, telephone number and the person responsible for the operation of the facility as a minimum.

- (2) Access to a hazardous waste storage facility must be limited to employees who have been trained with respect to the operation of the hazardous waste storage facility and emergency response procedures and any other person authorised by the owner of the hazardous waste storage facility.

9. Operation

- (1) A waste storage facility must be free from odour or emissions at levels likely to cause annoyance.
- (2) Waste must be sorted at source into various categories (recyclables and non-recyclables) and a documented procedure must be implemented to prevent any mixing of hazardous and general waste integrated waste management plan and/or Industry Waste Management Plan, if any.
- (4) A waste storage facility must be operated within its design capacity and the waste storage container must not be overfilled.
- (5) Liquid waste must be stored in leak resistant containers which must be inspected weekly for early detection of leaks.

10. General Requirements of Waste Storage Containers

- (1) A liquid waste container must be of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in its ordinary use.
- (2) Waste that is spilled or blown by wind during opening, handling or storage must be contained.
- (3) Hazardous waste must be stored in covered containers and only open when waste is added or emptied.
- (4) Below-ground pipes connected to the container must be protected from physical damage (e.g. excessive surface loading, ground movement or disturbance). If mechanical joints have to be used, they must be readily accessible for inspection.

- (5) A hazardous waste storage container, associated piping and equipment must be of sufficient structural strength to withstand normal handling and installed on stable foundation.
- (6) The foundation of a hazardous waste storage container must be protected from, or resistant to all forms of internal and external wear, vibration, corrosion, fire, heat, vacuum and pressure which might cause the storage tank foundation to fail.
- (7) A leak monitoring device must be installed on an underground liquid waste storage container and piping to and from the container in order to keep operating personnel informed.
- (8) If a container is lined or internally coated, the coating must be compatible with the substance stored. Furthermore the coating specification must adhere to existing engineering practices and the applicable standards or requirements.
- (9) The waste storage tank must be a closed system and pressure resistant.
- (10) In a case where a tank or vent pipe is not visible during the filling process an automatic overflow prevention device must be fitted onto the tank.

11. Minimum Requirements for above ground waste storage facilities

- (1) A hazardous waste container resting on the ground must be underlain by barriers, which will not deteriorate with permeability rate of the waste stored.
- (2) Bottoms of the container in contact with soil and are subject to corrosion must be protected from external corrosion by either ensuring that the container is made of corrosion resistant materials or the container have a cathodic protection system.
- (3) A waste storage tank must not have mechanical joints, except if it can be accessed for inspection.
- (4) The screw fitting or other fixed coupling fitted to the tank must be maintained in good condition and must only be used when filling the tank.

12. Minimum Requirements for underground waste storage containers

- (1) Underground waste storage container must have double walled and synthetic liners and underground vaults must be installed.
- (2) A steel underground tank and piping in contact with soil must be protected from corrosion using corrosion resistant materials or cathodic protection.
- (3) Container components that are placed underground and backfilled must be provided with a backfill material that is a non-corrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.
- (4) If external coating is used to protect the tank from external corrosion, the coating must be fiberglass, reinforced, plastic, epoxy, or any other suitable dielectric material.

Chapter 3**General Provisions****13. Training**

- (1) Training must be provided continuously to all employees working with waste and to all contract workers that might be exposed to the waste.
- (2) The training programme must amongst others include the following:
 - (a) Precautionary measures that need to be taken;
 - (b) Procedures that the employees must apply to their particular type of work;
 - (c) Procedures for dealing with spillages and accidents;
 - (d) Appropriate use of protective clothing; and
 - (e) The risks of the hazardous substances to their health which they are likely to be exposed to.

- (3) A sufficient number of employees must receive training to cover for leave periods, absences due to illness, public holidays or any other reason.
- (4) An attendance register must be kept and signed by each employee at each training session and made available to the relevant authorities when required.
- (5) Only trained persons must be allowed to handle hazardous waste.

14. Emergency Preparedness Plan

- (1) Waste can be hazardous or dangerous to the environment if not handled properly or if stored inappropriately. To minimise environmental impacts, a waste storage facility must have an emergency preparedness plan including the following:
 - (a) Hazard identification;
 - (b) Prevention measures;
 - (c) Emergency planning;
 - (d) Emergency response;
 - (e) Remedial actions.
- (2) Immediate action must be taken to contain spillage and prevent it from entering storm water drains or environment.

15. Monitoring and Inspection

- (1) Containers, tanks, valves and piping containing hazardous waste must be inspected for leaks, structural integrity and any sign of deterioration (e.g. corrosion or wearing of protective coatings) on a weekly basis.
- (2) A registered engineer must inspect tanks containing hazardous waste at least once per annum to check tank integrity, corrosion, piping, valves, bunding, and impermeability of the bund wall and bund floor.

- (3) The secondary containment system must be examined at least weekly or after each significant precipitation event to ensure that the containment is free of debris, rainwater and other materials that would compromise the capacity and integrity of the system.
- (4) Ventilation systems, sump pumps, emergency alarms, impressed current corrosion protection systems, level alarms and other mechanical systems must be inspected on a weekly basis to ensure proper functioning based on manufacturer recommendations, regulatory requirements or best practice.
- (5) Inspection must include the review of the adequacy and accessibility of spill response equipment.
- (6) If environmental pollution is suspected or is occurring from the waste storage facility, an investigation must be initiated into the cause of the problem or suspected problem and remedial action taken.

16. Auditing

Internal Audits

- (1) Internal audits must be conducted bi-annually and on each audit occasion an official report must be compiled by the relevant auditor to report the findings of the audits, which must be made available to the external auditor.

External Audits

- (2) An independent external auditor must be appointed to audit the waste storage facility biennially and the auditor must compile an audit report documenting the findings of the audit, which must be submitted to the relevant authority.
- (3) The external audit report must-
 - (a) specifically state whether conditions of these standards are adhered to;

- (b) include an interpretation of all available data and test results regarding the operation of the storage facility and all its impacts on the environment;
- (c) specify target dates for the implementation of the recommendations to achieve compliance;
- (d) contain recommendations regarding non-compliance or potential non-compliance and must specify target dates for the implementation of the recommendations and whether corrective action taken for the previous audit non conformities was adequate; and
- (e) show monitoring results graphically and conduct trend analysis.

17. Relevant Authority Audits and Inspections

- (1) The relevant authority responsible for waste management reserves the right to audit and/or inspect the waste storage facility without prior notification at any time.
- (2) Any records or documentation pertaining management of the waste storage facility must be available to the relevant authorities upon request, as well as any other information which may be required.

18. Reporting

- (1) An emergency incident must be reported in accordance with section 30 of NEMA.
- (2) An action plan which includes a detailed time schedule, and resource allocation to address any incident must be signed off by the senior management of the organisation.
- (3) Complaints register and incident report must be made available to the external auditor and relevant authority.
- (4) Each external audit report must be submitted to the relevant authority within 30 days from the date on which the external auditor finalized the audit.

19. Records

- (1) Each waste storage facility must be able to provide documentation verifying the following:
 - (a) number of waste storage containers or tanks within the facility;
 - (b) date of collection; and
 - (c) authorized collector or collectors and proposed final point of treatment, recycling or disposal.
- (2) Any deviations from the approved integrated or industry waste management plan must be recorded.
- (3) Records must be kept for a minimum of 5 (five) years and must also be available for inspection by the relevant authority.

20. Minimum Requirements during the Decommissioning Phase

- (1) A waste storage facility to be discontinued, the site must be rehabilitated to the satisfaction of the relevant authority.
- (2) A rehabilitation plan for the site, including the indication of end use of the area must be developed and submitted to the DEA for approval not more than 1 (one) year prior to the intended closure of the facility.
- (3) The rehabilitation plan must indicate the following:
 - (a) measures for rehabilitating contaminated areas within the facility; and
 - (b) manner in which the waste resulted from decommissioning activities will be managed.
- (4) The site must be rehabilitated according to such a plan.
- (5) The owner of the facility, including the subsequent owner of the facility will remain responsible for any adverse impacts on the environment, even after operations have

ceased.

CHAPTER 4

MISCELLANEOUS

21. Transitional provisions

A person who lawfully operated a waste storage facility for the storage of general and hazardous waste prior to and on the date of coming into operation of these standards may continue with the activity for the duration as stipulated in the permit or licence and after the expiry of the permit or licence comply with these standards.
