
PROPOSED KGABALATSANE SOLAR ENERGY FACILITY IN THE NORTH WEST PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the draft Environmental Impact
Assessment Report

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Prepared for

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives 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 not be significant, but 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 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 have a notable effect on one or more aspects of the environment.

TABLE OF CONTENTS

 PAGE
CHAPTER 1 PROJECT DETAILS.....	1
1.1. Activities and Components associated with the Solar Energy Facility	3
1.2. Findings of the Environmental Impact Assessment.....	8
Impacts on Ecology.....	8
Soil and Agricultural Potential Impacts	10
Visual Impacts	11
Impacts on Heritage Sites and Palaeontology	11
Impacts on the Social Environment.....	12
Evaluation of Power line Alternatives Facility	12
1.3. Benefits of the Proposed Project	13
CHAPTER 2 PURPOSE and OBJECTIVES OF THE EMPR	15
CHAPTER 3 STRUCTURE OF THIS EMP.....	17
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	17
3.1. Project Team	19
CHAPTER 4 KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT	20
CHAPTER 5 MANAGEMENT PROGRAMME: PLANNING AND DESIGN	30
5.1 Objectives	30
a) OBJECTIVE: Ensure the facility design responds to identified environmental constraints and opportunities	30
b) OBJECTIVE: Ensure the selection of the best environmental option for the alignment of the power line and access roads.....	36
c) OBJECTIVE: Minimise storm water runoff (guideline for stormwater management plan)	37
d) OBJECTIVE: To ensure effective communication mechanisms	39
CHAPTER 6 MANAGEMENT PROGRAMME: CONSTRUCTION	41
6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase	41
a) OBJECTIVE: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMP	41
6.2 Objectives	45
a) OBJECTIVE: Minimise impacts related to inappropriate site establishment	45
b) OBJECTIVE: Appropriate management of the construction site and construction workers.....	47
c) OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase.....	49
d) OBJECTIVE: Avoid the potential impacts on family structures and social networks associated with presence of construction workers from outside the area	51

e) OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site (Traffic Management and Transportation Plan)	54
f) 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 ..	56
g) OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase.....	57
h) 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	59
i) OBJECTIVE: Minimisation of development footprint and disturbance to topsoil.....	60
j) OBJECTIVE: To minimize the loss of habitat and indigenous biodiversity...	63
k) OBJECTIVE: Minimise loss of indigenous biodiversity, including plants of conservation concern	64
l) OBJECTIVE: Minimise the establishment and spread of alien invasive plants (Invasive Plant Management Plan) and manage indigenous invasive plants	66
m) OBJECTIVE: Minimise soil degradation and erosion (Erosion management Plan).....	69
n) OBJECTIVE: The mitigation and possible negation of the additional visual impacts associated with the construction and operation of the solar energy facility	72
O). OBJECTIVE: Appropriate handling and management of waste	75
p) OBJECTIVE: Appropriate handling and storage of chemicals and hazardous substances	77
q) OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase	79
6.3 Detailing Method Statements	80
a) OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk.....	80
6.4 Awareness and Competence: Construction Phase of the Solar Energy Facility	83
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	83
6.4.1 <i>Environmental Awareness Training</i>	84
6.4.2 <i>Induction Training</i>	84
6.4.3 <i>Toolbox Talks</i>	84
6.5 Monitoring Programme: Construction Phase.....	85

a) OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards	85
6.5.1 <i>Non-Conformance Reports</i>	85
6.5.2 <i>Monitoring Reports</i>	86
6.5.3 <i>Final Audit Report</i>	86
CHAPTER 7 MANAGEMENT PROGRAMME: REHABILITATION	87
7.1. Objectives	87
a) OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed	87
CHAPTER 8 MANAGEMENT PROGRAMME: OPERATION	92
8.1. Roles and Responsibilities for the Operation Phase of the Solar Energy Facility	92
8.2. Objectives	93
a) OBJECTIVE: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation	93
b) OBJECTIVE: Limit the ecological footprint of the facility	94
c) OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the Proposed Solar Energy Facility	95
d) OBJECTIVE: Minimise soil degradation and erosion (Erosion Management Plan).....	96
e) OBJECTIVE: Minimise dust and air emissions.....	97
f) OBJECTIVE: Ensure the implementation of an appropriate fire management plan during the operation phase	98
g) OBJECTIVE: Maximise local employment and business opportunities associated with the operational phase	100
h) OBJECTIVE: Appropriate handling and management of waste.....	101
CHAPTER 9 MANAGEMENT PROGRAMME: DECOMMISSIONING	104
9.1. Site Preparation	104
9.2. Disassemble and Remove Infrastructure.....	104
9.3. Objectives	104
a) OBJECTIVE: To avoid and or minimise the potential social impacts associated with the decommissioning phase.....	104
b) OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the Proposed Kgalatsane Solar Energy Facility.....	105
CHAPTER 10 FINALISATION OF THE EMP	107

Appendices:

Appendix A: Grievance Mechanism for Public Complaints and Issues

Appendix B: Guidelines for Integrated Management of Construction Waste

PROJECT DETAILS

CHAPTER 1

Built Environment Africa Energy Services (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with an export capacity of up to 50MW, as well as associated infrastructure on a site located approximately 18 km north-east of Brits in the North West Province. The Kgabalatsane Solar Energy Facility is proposed to be located on the farm Syferfontein 430 which is south of the Odi Aerodrome, 2km south of the Kgabalatsane settlement and 3km west of the township of Garankuwa within the Madibeng Local Municipality, in the North West Province (refer to Figure 1.1).

The proposed facility is envisaged to make use of **photovoltaic (PV)** technology with a maximum total export capacity of **55 MW** and will include the following infrastructure:

- » **Photovoltaic (PV) panels**
- » An on-site substation to evacuate the power from the facility via a new 132kV overhead power line into the Garankuwa Substation. The proposed 132kV power line will be ~16km in length. Mounting structures to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
- » Cabling between the project components, to be lain underground where practical.
- » Internal access roads and fencing.
- » Workshop area for maintenance, storage, and offices

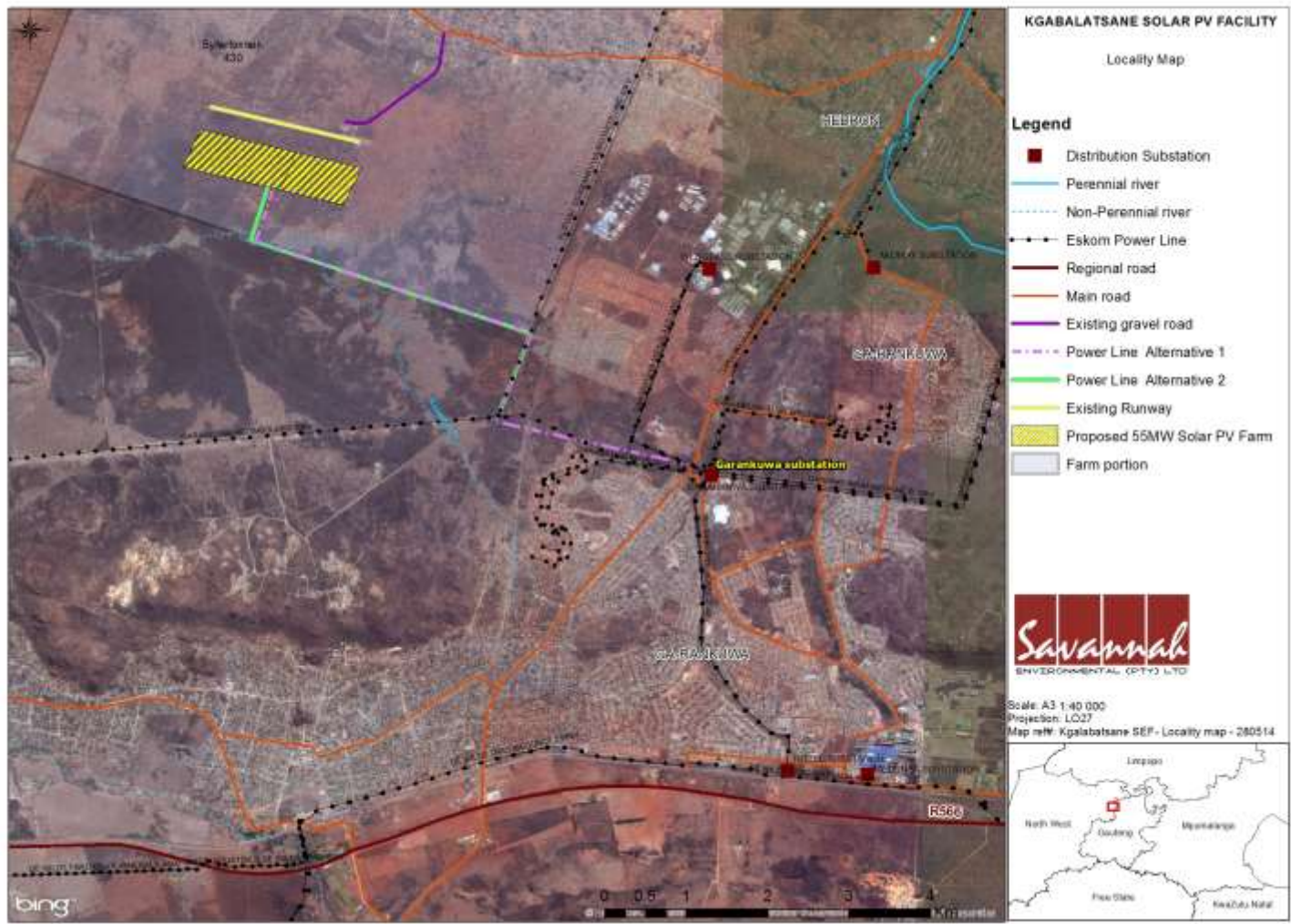


Figure 1.1: Locality map showing the broader study site identified for the proposed facility

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:

Based on the information from other solar energy facility projects the construction phase for a 50 MW SEF is expected to extend over a period of 12-18 months and create approximately 200 employment opportunities during peak construction. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the SEF and the associated components, including, access roads, substation, services and power line. It is anticipated that approximately 60% (120) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 25% (50) for semi-skilled workers (drivers, equipment operators etc.) and 15% (30) for skilled personnel (engineers, land surveyors, project managers etc.).

The total wage bill for the construction phase is estimated to be in the region of R 30 million (2014 rand value). This is based on the assumption that the average monthly salary for low skilled, semi-skilled and skilled workers will be in the region of R 5 000, R 8 000 and R 30 000 respectively for a period of 16 months. Members from the local communities are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community in the area and Ga-Rankuwa. Given high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with the contractors appointed to construct the SEF and associated infrastructure. However, in the absence of specific commitments from the developer to maximise local employment targets the potential opportunities for local employment will be limited. In addition, the low education and skills levels in the area may also hamper potential opportunities for local communities.

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	<p>Prior to initiating construction, a number of detailed surveys will be required including, but not limited to:</p> <ul style="list-style-type: none"> » <i>Geotechnical survey</i> – the geology and topography of the study area will be confirmed. The geotechnical study will look at flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be built and the extent of earthworks and compaction required in the establishment of any internal access roads. » <i>Site survey</i> – this will be required to finalise the design layout of the solar field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation (once issued) for the facility.
Establishment of access roads	<p>An access road from an unnamed tarred road located to the north of the site that leads to the ODI aerodrome from the township of Kgabalatsane. This access road will be used to access the site. Internal roads within the study site need to be established to provide access during construction and operational phase.</p> <p>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.</p>
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 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) 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

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

Activity	Description
	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 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	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Electricity distribution infrastructure will be put up to include one substation of up to a maximum dimension of 150m x 150m. An on-site substation to evacuate the power from the facility via a new 132kV overhead power line into the Garankuwa Substation. The proposed 132kV power line will be ~16km in length. 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 33 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	<ul style="list-style-type: none"> » Once construction is completed and all construction equipment is removed, the areas affected by construction activities must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site that are not required during the operational phase or by the landowner must be closed and prepared for rehabilitation.

Operation and Maintenance Phase:

The 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 transfer the electricity generated to the national grid via the Eskom’s power line and Garankuwa 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 Kgabalatsane Solar Energy Facility, both potentially positive and negative impacts have been identified. The most significant environmental impacts associated with the proposed project include:

The most significant environmental impacts associated with the proposed project, as identified through the EIA, therefore include:

- » Impacts on Ecology
- » Impacts on soil and agricultural potential
- » Heritage and palaeontological impacts
- » Social impacts

Impacts on Ecology

The vegetation of the site is representative of Marikana Thornveld and a large proportion of the species is reportedly typical of this vegetation type were observed at the site. The majority of the site has been disturbed by ploughing in the past, which is contradictory to the desk-top information which indicates that the site is classified as a CBA on the basis that it represents intact vegetation. Due to the previously disturbed and ploughed nature of the site, several potentially highly significant impacts associated with the development are reduced to a low level, especially those on vegetation and CBAs. It is only a small section of the proposed development area along the western boundary of the site which is considered relatively sensitive on account of the lower level of disturbance which characterises this area.

The density of woody plants at the site varies considerably and there are some parts of the site which can be considered to be bush-encroached. The only area at the site which is considered to be of higher sensitivity is along the western margin of the site where there is a less disturbed area which may also have been disturbed in the past but retains a greater degree of structural integrity than the rest of the site. Due to the Vulnerable status of Marikana Thornveld, this area should be avoided. Although there are a number of plant species of conservation concern known from the area, none of these were observed at the site and it is highly unlikely that any of these species are present. There are however a number of protected tree species present including Marula *Sclerocarya birrea*. The density of these species within the site is however low and it is not likely that the development would compromise the local populations of any of these species.

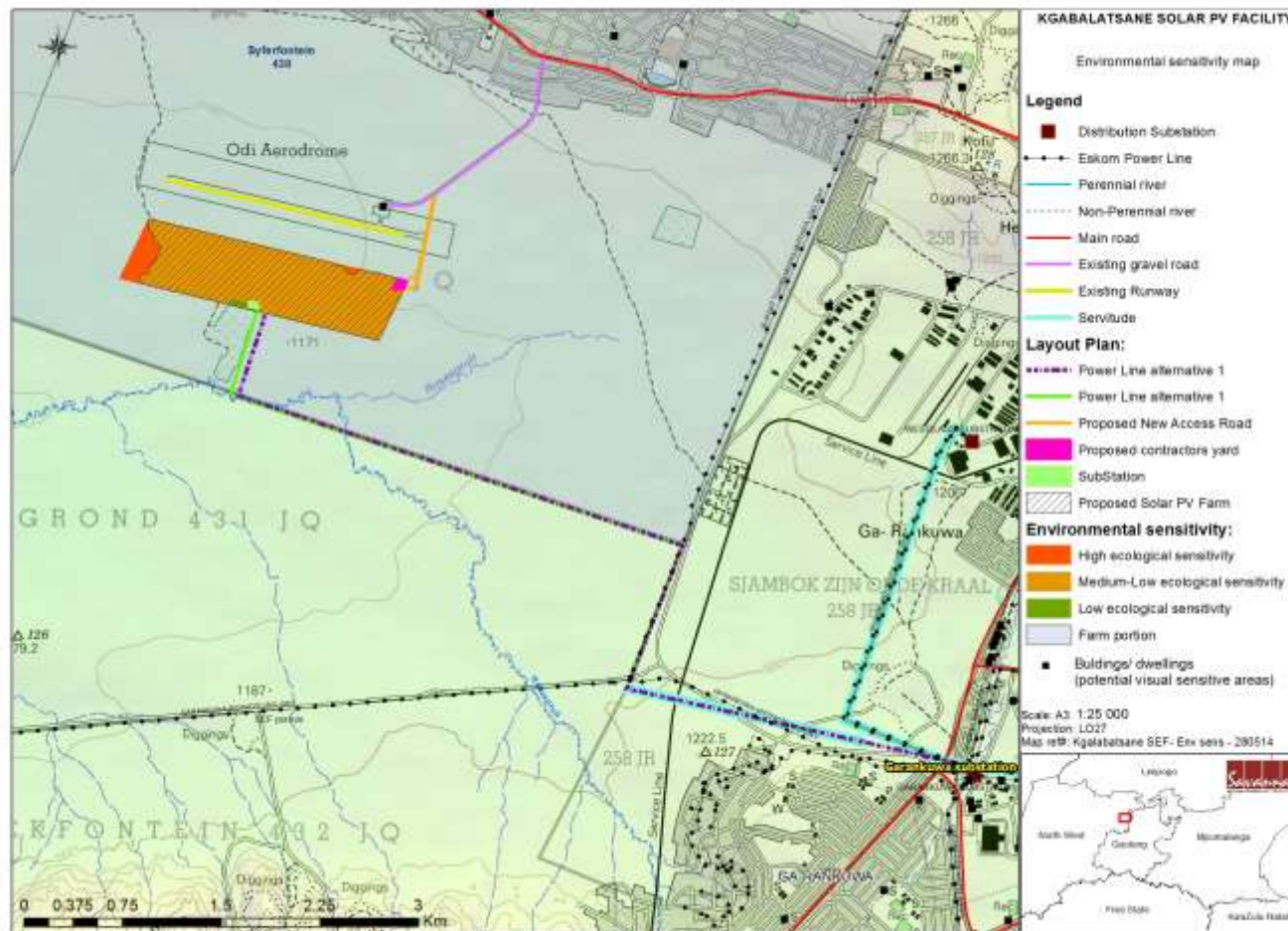


Figure 1.2: Sensitivity map for the proposed Kgabalatsane Solar Energy Facility

There are a number of plant species of conservation concern known from the area. None of these were observed at the site and it is highly unlikely that any of these species are present. There are however a number of protected tree species present including *Marula Sclerocarya birrea*. The density of these species within the site is however low and it is not likely that the development would compromise the local populations of any of these species.

The Kgabalatsane PV Facility is likely to result in ecological impacts of low overall significance and there are no highly significant impacts that would represent a red-flag or fatal flaw for the development.

The following recommendations are made for the proposed site:

- » Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.
- » Due to the disturbance at the site as well as the increased runoff expected to be generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.
- » Regular monitoring for alien plants must be undertaken within the development footprint.

Soil and Agricultural Potential Impacts

The soils on the site are reddish in colour, with a weak to moderate grade of structure. The texture is medium to heavy, with clay content between 30% and 50%. They are mostly moderately deep, although depths of up to 1 200mm were encountered.

Soil depths range from 400 mm to 1 200 mm. The area has been previously cultivated, and the natural vegetation consists of grass, shrubs and trees. The Hutton soil form was dominant in the area, with Shortlands comprising the subdominant portions. Both solid and cracked, weathered rock underlie the soils of the survey area.

The impacts for the proposed project:

- » Loss of agricultural land for arable cultivation during and after the construction phase due to placement of the facility and the power line
- » Soil erosion

Visual Impacts

The anticipated visual impacts range from **moderate to low**, with the highest significance relating to impacts on sensitive visual receptors located in close proximity to the proposed facility and the anticipated visual impact on Sense of Place.

- » The theoretical visibility within a 2km radius of the facility includes mainly vacant land and sections of the Kgabalatsane residential area (to the north) and the informal residential area located east of the site. Visual impacts of the solar energy facility on sensitive visual receptors within a 2km radius of the site (i.e. residents on the outskirts of Kgabalatsane and the informal settlement to the east of the site) are expected to be of moderate significance.
- » Visibility between the 2-4km radii includes sections of Kgabalatsane and Rebokala, and sections of the local road connecting these towns. The built-up nature of these areas and the occurrence of built structures and associated visual clutter are expected to virtually nullify the potential visual exposure, or at the very least restrict it to the outlying areas of these towns.
- » Visual impacts of the solar energy on sensitive visual receptors beyond a 2 km radius of the site (i.e. users of the R566 and secondary roads as well as residents on the outskirts of Rabokala, the informal settlement east of the site, Kgabalatsane, Ga-Rankuwa, Ramogodi, Mothutlung and Makau) are expected to be of low significance.
- » The visual impact of on site ancillary infrastructure (i.e. the substation, the access roads and fencing) on sensitive visual receptors in close proximity to the solar energy is expected to be of low significance.
- » The visual impact of the 132kV power line on sensitive visual receptors in close proximity thereto is likely to be of moderate significance. This is true for both alignment options.
- » The visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed solar energy facility will be of low significance.
- » The visual impacts related to construction on sensitive visual receptors in close proximity to the proposed facility will be of low significance.
- » In terms of secondary visual impacts, the significance of the anticipated impact on the visual quality of the landscape and the sense of place of the region is expected to be of low significance.

Impacts on Heritage Sites and Palaeontology

No sites of archaeological or heritage significance were identified during the heritage survey. A Palaeontological desktop study by Prof Marion Bamford (2012) for the area also indicated that there is no impact foreseen on the fossil record of

South Africa. However, if during construction, any archaeological finds are made (e.g. stone tools, skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds.

It was concluded that the power line options considered will have a low impact on archaeological and paleontological resources since the area it will be traversing is highly disturbed by agricultural activities. It is however recommended that the final route option preferred by the developers is subjected to an archaeological walk through survey before the commencement of construction.

Impacts on the Social Environment

The findings of the SIA indicate that the development of the proposed Kgabalatsane Solar Energy Facility will result in positive social impacts as a result of the creation of employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. In addition, the proposed establishment of a number of renewable energy facilities in the Madibeng Local Municipality and North West Province will create socio-economic opportunities, which, in turn, will result in a positive social benefit. The significance of this impact is rated as High Positive.

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 Kgabalatsane Solar Energy Facility is therefore supported by the findings of the SIA. However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored.

Evaluation of Power line Alternatives Facility

The most significant environmental impacts associated with the proposed construction of the power line, as identified through the EIA include:

» Impacts on avifauna

The presence of the power line may lead to negative impacts on avifauna as a result of electrocution or collisions with the power line. New power line infrastructure should be bird-friendly in configuration and adequately insulated. These activities should be supervised by someone with experience in this field.

» **Impacts on heritage resources**

Connection to the power grid consists of two options. The power line will have a low impact on archaeological resources since the area it will be traversing is highly disturbed by agricultural activities. It is however recommended that the final route option preferred by the developers is subjected to an archaeological walk down before development can start.

» **Visual impacts**

Visibility of the proposed power line was calculated at a height of 20m above ground level, for a distance of 2 km on either side of the proposed line. It is clear from the map that just about all of the area within the above 2km offset will be exposed to potential visual impact as a result of this line.

Sensitive receptors within this viewshed include residents on the outskirts of the informal settlement east of the site, parts of Ga-Rankuwa, Ramogodi and users of various secondary roads.

- » Of note is that the eastern third of the line runs alongside the existing 400kV line. This consolidation of infrastructure is considered desirable from a visual perspective as it limits the cumulative extent of visual impact within the region.
- » The anticipated visual impact resulting from the proposed 132 kV power line is thus likely to be of **moderate** significance. No mitigation of this impact is possible, but measures are recommended as best practice.

» **Impacts on the social environment**

The findings of the SIA indicate that both power line Options are feasible from a social perspective, as both are largely aligned across vacant BBMTA land, and the portion of Alternative 1 located in Ga-Rankuwa traverses an open area with sufficient space to accommodate an additional 132 kV servitude.

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 55 MW export capacity Solar energy facility in the North West Province has been established by **Built Environment Africa Energy Services (Pty) Ltd** . The positive implications of establishing a solar energy facility on the demarcated sites within the North West Province include:

- » The potential to harness and utilise solar energy resources within the North West Province
- » The project would assist the South African government in reaching their set targets for renewable energy.
- » The project would assist the South African government in the implementation of its green growth strategy and job creation targets.
- » The project would assist the district and local municipalities in reducing level of unemployment through the creation of jobs and supporting local business
- » The National electricity grid in the North West 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 EMP is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an 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 55 MW Kgabalatsane Solar Energy Facility. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to, updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Section 33 of the EIA Regulations 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.

Built Environment Africa Energy Services (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the EIA process for the proposed Kgalatsane Solar Energy Facility, 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 EMP

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 Kgabalatsane Solar Energy Facility, as the project developer, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an overarching 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 EMP.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and 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 letter 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
Alien Invasive Management Plan	Chapter 6
Re-Vegetation and Habitat Rehabilitation Plan	Chapter 7
Traffic & Transport Management Plan	Chapter 6
Storm Water Management Plan	Chapter 5
Erosion Management Plan	Chapter 6 Chapter 8,
Plant Rescue and Protection Plan	Chapter 6

3.1. Project Team

This draft EMPr was compiled by:

	Name	Company
EMP Compilers:	Umeshree	Savannah Environmental
	Jo-Anne Thomas	
Specialists:	Simon Todd (Ecology)	Simon Todd Consulting
	Johann Lanz (Soils and Agricultural Potential)	Environmental Research Consulting
	Jaco van der Walt (Heritage)	Heritage Contracts and Archaeological Consulting CC (HCAC)
	Tony Barbour and Schalk van der Merwe (Social)	Tony Barbour: Environmental Consulting And Research
	Lourens du Plessis	MetroGIS

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

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

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

- » National Environmental Management Act (Act No 107 of 1998)
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
- » Guidelines published in terms of the NEMA EIA Regulations, in particular:
 - * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
 - * Public Participation in the EIA Process (DEA, 2010)
 - * International guidelines – the Equator Principles: The Equator Principles is a credit risk management framework for determining, assessing and managing environmental and social risk in project finance transactions. The Principles are based on the International Finance Corporation (IFC) Performance Standards on social and environmental sustainability and on the World Bank Group Environmental, Health, and Safety Guidelines.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the scoping report, and to be addressed in the EIA. A listing of relevant legislation is provided in Table 4.1.

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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
<p>National Environmental Management Act (Act No 107 of 1998)</p>	<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 Assessment Process is required to be undertaken for the proposed project.</p>	<p>Department of Environmental Affairs – competent authority</p>	<p>The listed activities triggered by the proposed solar energy facility have been identified and have been assessed in this report. The FEIR will be submitted to DEA for review and decision-making.</p>
<p>National Environmental Management Act (Act No 107 of 1998)</p>	<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</p>	<p>Department of Environmental Affairs</p>	<p>While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the Environmental Assessment Process through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	holistically, and to consider the cumulative effect of a variety of impacts.		
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs 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. There is no requirement for a noise permit in terms of the legislation.
National Water Act (Act No 36 of 1998)	<p>Water uses under 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).</p> <p>Consumptive water uses may include the taking of water from a water resource - Sections 21a and b.</p> <p>Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i.</p>	Department of Water Affairs Provincial Department of Water Affairs	The proposed development will not encroach on any water resources. Therefore, a Water Use Licence is not required.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	<p>A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.</p> <p>Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.</p> <p>S53 Department of Mineral Resources: Approval</p>	Department of Mineral Resources	<p>NO borrow pits are expected to be required for the proposed project. Therefore, no mining permit/mining right is expected to be required.</p> <p>A Section 53 application will be submitted the North West DMR office.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32) – Regulations promulgated in November 2013. Measures to control noise (S34) - no regulations promulgated yet.	Department of Environmental Affairs	No permitting or licensing requirements applicable to this project arise from this legislation. A dust management plan may be required to be implemented, as determined by the Air Emissions Licensing Authority.
National Heritage Resources Act (Act No 25 of 1999)	<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 palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). 	South African Heritage Resources Agency	An HIA was undertaken for the proposed facility and sites have been highlighted which require permits.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<ul style="list-style-type: none"> » 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>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 (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: 	<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>The Marula <i>Sclerocarya birrea</i> is also a protected tree species under the National Forests Act and the appropriate permit would be required if any of individuals of this species are impacted by the development. A single individual of this species was observed at the site near the location of the on-site substation during the current survey and an additional individual was observed during the previous studies at the site, but falls outside of the current development footprint.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>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>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 have been developed and will be implemented.</p>
<p>National Forests Act (Act No. 84 of 1998)</p>	<p>According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.</p>	<p>Department of Agriculture, Forestry and Fisheries</p>	<p>There appears to be no threat to any protected tree species at the site (National Forests Act No. 84 of 1998) apart from <i>Acacia erioloba</i> trees which are present at the site. A permit should be requested in order to get permission to remove these trees. Note that although <i>Acacia erioloba</i> is a protected species, it is not a threatened species. Very few <i>Acacia erioloba</i> trees are present at the site.</p>
<p>National Veld and Forest Fire Act (Act 101 of 1998)</p>	<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</p>	<p>Department of Agriculture, Forestry and Fisheries (DAFF)</p>	<p>While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>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>		
<p>Hazardous Substances Act (Act No 15 of 1973)</p>	<p>This Act regulates the control of substances that may cause injury, or ill health, or death 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; Group IV: any electronic product; and 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>	<p>Department of Health</p>	<p>It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.</p>
<p>Development</p>	<p>Provides for the overall framework and</p>	<p>Local Municipality</p>	<p>The applicant must submit a land development</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Facilitation Act (Act No 67 of 1995)	administrative structures for planning throughout the Republic. S (2 - 4) provides general principles for land development and conflict resolution.		application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	Department of Agriculture	Subdivision in terms of S24 and S17 of the Act needs to be adhered to.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	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. The Minister may amend the list by – <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. 	National Department of Environmental Affairs (hazardous waste) Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation phase are required to be undertaken in accordance with the requirements of the Act and associated Regulations and Guidelines.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Road Traffic Act (Act No 93 of 1996)	<ul style="list-style-type: none"> » The technical recommendations for highways (TRH 11): "Final Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of » The National Road Traffic Act and the relevant Regulations. 	<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 which will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads.</p> <ul style="list-style-type: none"> » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the facility and substation components may not meet specified dimensional limitations (height and width).
Provincial Legislation			
North West Province Provincial Growth and Development Strategy	As a provincial policy framework, it sets the tone and pace for shared growth and development in the Province. It addresses the key social, economic, environmental and spatial imperatives	North West – Department of Economic Development Environmental	A permit is not required but this documentation has been considered in this report and will remain applicable through the life cycle of the proposed project.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	in the Province.	Conservation and Tourism	
Nature and Environmental Conservation Ordinance, No. 19 of 1974	» Lists plant and animal species as protected	DEDECT	The Marula <i>Sclerocarya birrea</i> is also a protected tree species under the National Forests Act and the appropriate permit would be required if any of individuals of this species are impacted by the development. A single individual of this species was observed at the site near the location of the on-site substation during the current survey and an additional individual was observed during the previous studies at the site, but falls outside of the current development footprint.
Local legislation			
Madibeng Local Municipality Integrated Development Plan	The plan aims at: » Development of urban agriculture; » Promotion of small scale, intensive farming; » Organic and hydroponic cultivation; and » Development and promotion of agro-industries.	Local municipality	A permit is not required but this documentation has been considered in this report and will remain applicable through the life cycle of the proposed project.

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

According to the national vegetation map (Mucina & Rutherford 2006), the site falls entirely within the Marikana Thornveld vegetation type. This vegetation type occurs in the North-West and Gauteng Provinces, from the Rustenburg area in the west, through Marikana and Brits to Pretoria in the east, at an elevation of 1050-1450m. The vegetation forms an open *Acacia karoo* woodland occurring in valleys and slightly undulating plains as well as some lowland hills. Shrubs are more common along drainage lines, on termitaria, rocky outcrops and other fire-protected habitats.

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 Ecological Studies and related 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 finalised, a detailed investigation of the footprint area during the optimal growing season and as described below must be conducted, followed by a species search and rescue operation before activity commences.

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 5.1**). The only area at the site of higher sensitivity is along the western margin of the site where there is a less disturbed area which may also have been disturbed in the past but retains a greater degree of structural integrity than the rest of the site. Due to the Vulnerable status of Marikana Thornveld, this area should be avoided. Although there are a number of listed plant species known from the area, none of these were observed at the site and it is highly unlikely that any of these species are present. There are however a number of protected species present including Marula *Sclerocarya birrea*.

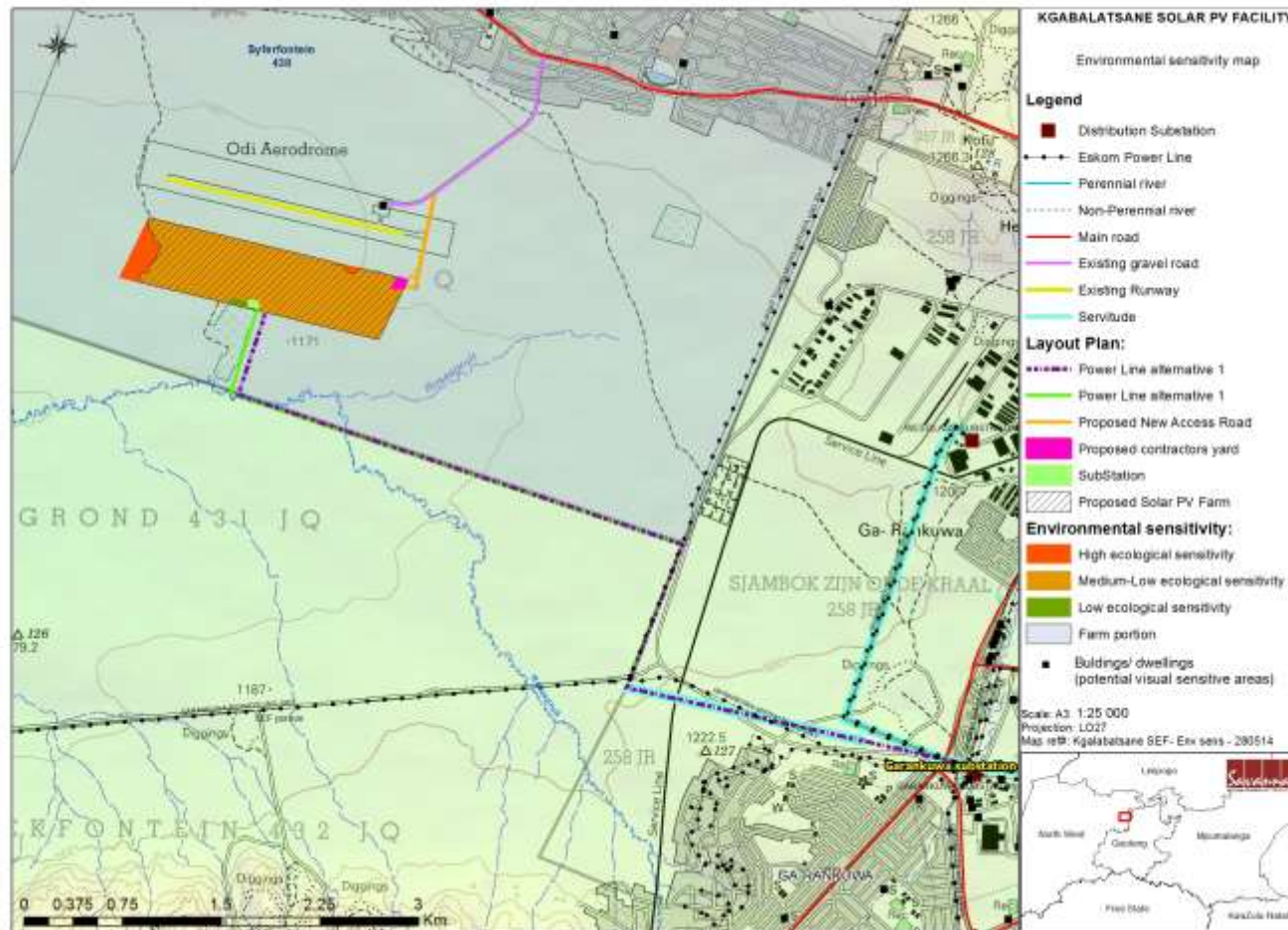


Figure 1.2: Sensitivity map of the proposed Kgabalatsane Solar Energy Facility

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"> » Placement of infrastructure that degrades the environment unnecessarily, particularly with respect to habitat destruction, loss of indigenous flora, damage to seepage areas or drainage lines, 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 lines 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
<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, 	Specialist/ Developer	Design review phase

Mitigation: Action/Control	Responsibility	Timeframe
<p>for linear structures, between which structures or other markers)</p> <ul style="list-style-type: none"> » Identification of the affected species by providing a representative photo record that enables ECOs 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 (birds, amphibians, reptiles and mammals), mapped by GPS, that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed person(s) » 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 search and rescue program for plants A comprehensive alien invasive species eradication and management plan 	Specialist/ Developer	Design review phase
<p>Obtain permits for protected plant removal and relocation prior to commencement of any activity related to this development</p>	Developer	Pre-commencement
<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 	Developer	Prior to submission of final construction layout plan

Mitigation: Action/Control	Responsibility	Timeframe
<p>close proximity to other existing or planned developments in the area</p> <ul style="list-style-type: none"> » 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. 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>Utilise existing roads as far as possible. Where new access roads, plan these and machinery turning points to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of topsoils, prevent obstruction or alteration of natural water flow</p>	Developer	Design phase
<p>Compile a comprehensive storm water management and erosion control plan for the footprint area as part of the final design of the project</p>	Developer/ Specialist	Design phase
<p>Permissible biodiversity:</p> <ul style="list-style-type: none"> » Depending on the final PV array and mechanism developed and taking all potential impacts, fire risks and maintenance requirements into consideration, it has to be decided upon and made clear: <ul style="list-style-type: none"> ○ Permissible vegetation: maximum height, desirable density and composition ○ Maintenance of this vegetation – mowing, small livestock grazing, etc. Note: due to the hydrogeology of the area, there should be no application of herbicides ○ 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 	Developer	Design phase
<p>After the permissible biodiversity has been determined, compile a comprehensive vegetation rehabilitation management plan.</p>	Specialist/ Developer	Design phase
<p>Depending on the type of PV panels selected for the</p>	Developer	Design phase

Mitigation: Action/Control	Responsibility	Timeframe
development, a plan must be put in place to deal with accidental breakages and potential release of harmful substances. This plan must include as a minimum: <ul style="list-style-type: none"> o How and where broken components can be disposed of – it must also be indicated if any material can be recycled, and where materials must then be taken for recycling. This should be incorporated into the waste management plan. 		

Performance Indicator	» 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 degradation prevented
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager and the ECO prior to the commencement of activity.

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

» **Access Road** - An access road from an unnamed tarred road located to the north of the site that leads to the ODI aerodrome from the township of Kgabalatsane. This access road will be used to access the site.

» **Power line** – The proposed 132kV power line will be ~16km in length.

Project Component/s	» Power line. » Access roads.
Potential Impact	» Route that degrades the environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, and erosion.
Activities/Risk Sources	» Alignment of power line. » Alignment of access roads.
Mitigation: Target/Objective	» To ensure selection of best environmental option for alignment of linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential

impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Select a power line alignment within the corridor assessed that curtails environmental impacts and enhances environmental benefits.	Built Environment Africa Energy Services (Pty) Ltd	Prior to submission of the final construction layout plan
Locate power line and access roads within disturbed corridors, as far as possible.	Built Environment Africa Energy Services (Pty) Ltd	Prior to submission of the final construction layout plan
Consider design level mitigation measures recommended by the specialists as detailed within the EIA report and relevant appendices.	Built Environment Africa Energy Services (Pty) Ltd	Design
Utilise existing roads as far as possible.	Built Environment Africa Energy Services (Pty) Ltd	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.

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

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be compiled and submitted to the ECO for acceptance.	Built Environment Africa Energy Services (Pty) Ltd	Pre-construction
Design infrastructure in order to reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	Built Environment Africa Energy Services (Pty) Ltd	Planning and design
Appropriately plan hard-engineered bank erosion protection structures.	Built Environment Africa Energy Services (Pty) Ltd	Planning and design
Ensure suitable handling of storm water within the site (i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities) through appropriate design of the facility.	Built Environment Africa Energy Services (Pty) Ltd	Construction and operation
Design measures for storm water management need to allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Built Environment Africa Energy Services (Pty) Ltd	Planning and design

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



d) OBJECTIVE: To ensure effective communication mechanisms

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

Project component/s	» Solar energy facility
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with solar energy facility construction » Activities associated with solar energy facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in Appendix A) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Built Environment Africa Energy Services (Pty) Ltd	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Built Environment Africa Energy Services (Pty) Ltd	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.	Built Environment Africa Energy Services (Pty) Ltd	Pre-construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMP. » 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 any remaining indigenous natural vegetation and habitats of ecological value (i.e. drainage lines).
- » 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, Built Environment Africa Energy Services (Pty) Ltd must ensure that the implementation of the facility complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation. Built Environment Africa Energy Services (Pty) Ltd 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 EMP

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

Project Manager will:

- » Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.

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

Site Manager (Built Environment Africa Energy Services (Pty) Ltd '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 EMP.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMP and its implementation.
- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or 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 Built Environment Africa Energy Services (Pty) Ltd prior to the commencement of any authorised activities. The ECO will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMP and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the EIA.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the EMP.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.

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

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient, provided that compliance with the requirements of the Environmental Authorisation, EMP and environmental legislation is maintained. In the absence of the ECO there should be a designated environmental officer present to deal with any environmental issues that arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

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

environmental impacts. The contractor's obligations in this regard include the following:

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

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

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

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 EMP, 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 EMP-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
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	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
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.		
Where necessary control access, fence, and secure area.	Contractor	Site establishment, and duration of construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
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 including drainage lines.	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	Contractor	Design Phase

Mitigation: Action/Control	Responsibility	Timeframe
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.		

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 EMP. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

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 12-18 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.

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

	» Types of materials or equipment and the manner in which they are stored or handled
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise impacts on the biophysical environment » To prevent any residual or cumulative impacts arising from temporary construction or storage areas

Mitigation: Action/Control	Responsibility	Timeframe
The location of the construction equipment camp and all access routes must take cognisance of any ecologically sensitive areas identified. »	Contractor	Pre-construction
No staff should be accommodated on site. Construction equipment and machinery 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.	Contractor	Construction
No temporary site camps will be allowed outside the footprint of the development area. » 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 shall be supplied with adequate facilities aimed at preventing any kind of pollution. Cooking on open fires must be prohibited, if staff need cooking/kitchen facilities on site, such should be provided by the contractor	Contractor	Construction
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: » Regularly check clothing and vehicles for mud and seed and clear in an appropriate manner	Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Do not wash down any machinery or vehicle within 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	<ul style="list-style-type: none"> » No visible erosion scars or any pollution once construction in an area is completed » All damaged areas successfully rehabilitated one year after completion » No damage to drainage lines or other types of water resource areas » Appropriate waste management
Monitoring	<ul style="list-style-type: none"> » Regular monitoring and audits of the construction camps and temporary structures on site by the ECO » A photographic record must be established before, during and after mitigation » An incident reporting system must be used to record non-conformances to the 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. ~120), 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
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	etc.
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.	Developer & contractors	Preconstruction/ construction
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase.	Developer & contractors	Preconstruction/ construction
Skills audit to be undertaken to determine training and skills development requirements.	Developer & contractors	Preconstruction/ construction
Develop a database of local BBBEE service providers and ensure that they are informed of tenders and job opportunities.	Developer & contractors	Preconstruction/ construction
Identify potential opportunities for local businesses	Developer & 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 in the area, 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 Kgabalatsane area.	Developer/ Contractor	Pre- construction/ construction
Identify local contractors who are qualified to undertake the required work.	Developer/ Contractor	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.	Developer/ Contractor	Pre- construction/ construction
Develop a Code of Conduct to cover the activities of the construction workers housed on the site.	Developer/ Contractor	Pre- construction/ construction

Mitigation: Action/control	Responsibility	Timeframe
		construction
Ensure that construction workers attend a brief session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	Developer/ Contractor	Pre- construction/ construction
Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	Developer/ Contractor	Pre- construction/ construction
Ensure that construction workers who are found guilty of breaching the Code of Conduct are disciplined accordingly. All disciplinary hearings and/or dismissals must be in accordance with South African labour legislation.	Developer/ Contractor	Construction
Provide opportunities for workers to go home over weekends.	Developer/ Contractor	Construction
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.	Developer/ Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Employment policy and tender documents that sets out local employment and targets completed before construction phase commences. » Majority of semi and unskilled labour locally sourced where possible. » 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.

An access road from an unnamed tarred road located to the north of the site that leads to the ODI aerodrome from the township of Kgabalatsane. This access road will be used to access the site.

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

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

Mitigation: Action/Control	Responsibility	Timeframe
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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.	Built Environment Africa Energy Services (Pty) Ltd and Contractor	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
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

Mitigation: Action/Control	Responsibility	Timeframe
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract
Appropriate signage must be placed along construction roads to identify speed limits, travel restrictions and other standard traffic control information. Signage must be maintained throughout the construction period.	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: 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 also result in stock thefts. The activities of construction workers 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.	Developer/ contractor	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	Contractor	Pre-construction/

Mitigation: Action/control	Responsibility	Timeframe
code of conduct for workers. All disciplinary hearings and any dismissals must be in accordance with South African labour legislation.		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	<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. » Proven compensation claims settled within 1 month of claim.
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.

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

Construction and operational activities of the proposed facility could lead to the loss of potential arable land. This could be either due to extensive loss of topsoil, soil seed banks, natural vegetation, erosion, or pollution. It is recommended that once it has been determined what the staffing requirements will be during construction and operation of the proposed facility, 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"> » 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

	<p>more prone to erosion and irreversible degradation</p> <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
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	<ul style="list-style-type: none"> » 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
<p>Minimise the footprint of the development where possible, at the same time avoid impacting on sensitive habitats</p> <ul style="list-style-type: none"> » The footprint for <i>all</i> development components should be defined before the construction phase commences » The specific EMPs shall provide for the mitigations 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 <ul style="list-style-type: none"> ○ 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 EMP.</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
<p>Monitor erosion and manage all occurrences according to the erosion management plan</p>	Contractor	On-going, from construction to de-commissioning
<p>Eradicate all weeds and alien invasive plants as far as practically possible</p> <ul style="list-style-type: none"> » 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 EMP » All relevant and specific EMPs 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
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 by monitoring any erosion present » A photographic record must be established before, during and after mitigation » An incident reporting system should be used to record non-conformances to the EMP, followed by the necessary action from the developer to ensure full compliance

h) 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	Contractor	Pre-construction/ construction

Mitigation: Action/control	Responsibility	Timeframe
tarpaulins or covers.		
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

Performance Indicator	<ul style="list-style-type: none"> » Dust suppression measures implemented for all access roads that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	<ul style="list-style-type: none"> » The proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

i) 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

Project Component/s	Project components affecting the objective: <ul style="list-style-type: none"> » PV Array supports and trenching » Grid connection and associated servitudes » Access roads » Workshop, guardhouses, substation and other related infrastructure » Potential topsoil stockpiles and/or borrow pits
Potential Impact	<ul style="list-style-type: none"> » Loss of topsoil and natural resources and biological activity within the topsoil

	<ul style="list-style-type: none"> » 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"> » 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
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
Construction activities must be restricted to demarcated areas so that impact on topsoil is restricted.	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 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 must be stored separately » Topsoils 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:	Contractor	Before and

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoils 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 natural wetlands ○ Ideally a disturbed but weed-free area » Height of the topsoil stockpiles should be minimised as far as possible. In general, 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 piling and reapplication, stored topsoils 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 ○ Monitoring and mitigating erosion where it appears 		<p>during construction</p>

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> ○ 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 topsoils:</p> <ul style="list-style-type: none"> » Spoil materials and subsoil must be back-filled first, then covered with topsoil » Generally, topsoils should be re-applied to a depth equal to slightly greater to the topsoil horizon of a pre-selected undisturbed reference site » The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm » If the amount of topsoil available is limited, a strategy must be worked out to optimise re-vegetation efforts with the topsoil available » Reapplied topsoils 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 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 topsoils need to be re-vegetated as soon as possible, following the re-vegetation and rehabilitation plan.</p>	Contractor	Before and during construction

j) OBJECTIVE: To minimize the loss of habitat and indigenous biodiversity

The loss of vegetation within the development footprint is an inevitable consequence of the development. In addition, protected plant species are confirmed to occur within the site and it is highly likely that these would be affected by the development.

Project component/s	All activities which require or result in the clearing of or impact to vegetation – such as site clearing, operation of heavy machinery, road construction etc.
Potential Impact	<ul style="list-style-type: none"> » Loss of intact vegetation » Loss of individuals of listed plant species » Erosion » Alien plant invasion
Activity/risk source	Construction activities, especially for roads, PV arrays, substations and other hard infrastructure.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimum disturbance footprint at site » No loss of individuals of protected plant species » Low levels of alien plant invasion » Minimal soil erosion » Rehabilitation of disturbed areas

Mitigation: Action/control	Responsibility	Timeframe
Demarcate important or sensitive areas as no-go areas.	Contractor	Construction
Ensure that rehabilitation plan is followed so that bare areas are not exposed for prolonged periods with likely erosion impacts	Contractor	Construction
Monitor disturbed areas for the presence and establishment of alien species.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No damage and limited siltation of local drainage systems » Low levels of alien plant abundance following construction. » In accordance to the Environmental Manager/Specialist - An acceptable cover of perennial grass has been established across the majority of cleared and disturbed areas at the end of the construction period
Monitoring	Evaluate and record progress of rehabilitation and the establishment of an effective perennial plant cover within disturbed parts of the site

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 the below specifications must be used as the basis for plant Search and Rescue program which 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 April) within the entire footprint area.

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"> » 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
<ul style="list-style-type: none"> » Search and Rescue (S&R) of all protected plants that will be affected by the development, especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. » 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 bagged (or cuttings taken where appropriate) 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. 	Horticultural Contractor	Prior to construction

Mitigation: Action/Control	Responsibility	Timeframe
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	Prior to and 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.</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

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

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

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

The disturbance created during construction is highly likely to encourage the invasion of the disturbed areas by alien species. The site is already heavily invaded and it is likely that the disturbed areas will become dominated by alien and disturbance-adapted species. Given the previously disturbed nature of the site, the significance of this impact is not likely to be high as the alien species are already present in the vegetation and the ground layer at least would presumably recover to a similar state to the current condition following disturbance.

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

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which invasive plants become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Shred all non-seeding material from cleared invasive shrubs and other vegetation and use as mulch as part of the rehabilitation and revegetation plan » Where possible, destroy seeding material of weeds and invasive 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
Immediately control any alien plants that become newly established using registered control measures	Contractor	Construction phase Operational phase
Risks from alien invasive do not only arise from invasive present within the footprint area, but also from alien invasive along the verges of the major transport routes, especially invasive grasses and smaller weeds. Similarly, invasive 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"> » On-going monitoring of area by ECO during construction. » 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.

m) 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 that historically covered the entire proposed development area 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.

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 » River/stream/drainage line road crossings » Roadside drainage ditches » Premature abandonment of follow-up monitoring and adaptive management of rehabilitation
Mitigation:	<ul style="list-style-type: none"> » To minimise erosion of soil from site during construction

Target/Objective	<ul style="list-style-type: none"> » 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 water resource 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
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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 within construction areas (prevent over-excavations and double handling)	Contractor	Before and during construction
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 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
General Erosion control measures: <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 	Contractor	Construction, phase

Mitigation: Action/Control	Responsibility	Timeframe
<p>prevent erosion are in place prior to construction.</p> <ul style="list-style-type: none"> » 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. » 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 cause erosion and sedimentation » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water 		
<p>Control depth of excavations and stability of cut faces/sidewalls</p>	Contractor	Site establishment & duration of contract
<p>Compile a comprehensive storm water management method statement, as part of the final design of the project and implement during construction and operation.</p>	Developer, Contractor	Site establishment & duration of contract
<p>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.</p>	Contractor	Construction phase Operational phase, monitored throughout
<p>All vehicles on site must be appropriate to access the site. No off-road driving is permitted.</p>	Contractor	Pre-construction, Construction &

Mitigation: Action/Control	Responsibility	Timeframe
		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
Construct an effective run-off control system to collect and safely disseminate water from all surfaces and during all phases of the project, without causing downstream erosion. The system will need to adapt to changing conditions through the construction phase into the operational phase.	Construction managers / Environmental manager	Project life time

Performance Indicator	<ul style="list-style-type: none"> » Minimal level of soil erosion around site attributable to the project. » Minimal level of increased siltation in drainage lines or pans attributable to the project. » Minimal level of soil degradation attributable to the project. » 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).
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 EMP.

n) 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 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 (i.e. within 2 km 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.	Developer / contractor	Early in the construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Developer / contractor	Early in the construction phase.
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Developer / contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Developer / 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.	Developer / 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).	Developer / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Developer / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. Consult an ecologist to give input into rehabilitation specifications.	Developer / 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.
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Monitoring

- » Monitoring of vegetation clearing during construction (by contractor as part of construction contract).
- » Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

O). 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 EMP.

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

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

Mitigation: Action/Control	Responsibility	Timeframe
impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.		
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be 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 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.
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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 EMP.
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p) OBJECTIVE: Appropriate handling and storage of chemicals and hazardous substances

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

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » 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
Procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock	Contractor	Duration of contract

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

Mitigation: Action/Control	Responsibility	Timeframe
cleared of potentially polluting materials.		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 EMP.

q) 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	Contractor	Construction

as livestock, damage to infrastructure etc.

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 EMP will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

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

- » Details of the responsible person/s
- » 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 occur;

- » Timing and location of activities;
- » Compliance/non-compliance with the Specifications; and
- » Any other information deemed necessary by the Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. Very specific areas to be addressed in the method statement: before, during and post construction includes:

- » Site Establishment plan (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- » Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure and processes.
- » Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions as applicable).
- » Stipulate the storm water management procedures recommended in the storm water management plan.
- » Ablution facilities (placement, maintenance, management and servicing).
- » Solid Waste Management:
 - * Description of the waste storage facilities (on site and accumulative).
 - * Placement of waste stored (on site and accumulative).
 - * Management and collection of waste process.
 - * Recycle, re-use and removal process and procedure.
- » Liquid waste management:
 - * The design, establish, maintain and operate suitable procedures for pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
 - * Stipulate grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) that needs to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.
- » Dust and noise pollution:
 - * Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels (construction activities generating output levels of 85 dB(A) near human settlement, are to be confined to working hours (06h00 - 18h00) Mondays to Fridays).

- * Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- » Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
 - * List of all potentially hazardous substances to be used.
 - * Appropriate handling, storage and disposal procedures.
 - * Prevention plan of accidental contamination of soil at storage and handling areas.
 - * All storage areas, (i.e.: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (i.e.: removal to reintroduction or replanting, if necessary).
- » Rehabilitation and re-vegetation process.
- » Traffic management.
- » Incident and accident reporting protocol.
- » General administration (and stipulating that all documentation and licences must be on site at all times).
- » Designate access road and the protocol on while roads are in use.
- » Requirements of gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Built Environment Africa Energy Services (Pty) Ltd's Construction Manager /Project Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement 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 EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a PV plant and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
- » The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.

- » Records must be kept of those that have completed the relevant training.
- » Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
- » Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

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

6.4.1 Environmental Awareness Training

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

6.4.2 Induction Training

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

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

6.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the

prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5 Monitoring Programme: Construction Phase

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

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

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

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

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 be required by the relevant authority.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

6.5.2 Monitoring Reports

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

6.5.3 Final Audit Report

A final environmental audit report must be submitted to DEA upon completion of the construction and rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMP.

MANAGEMENT PROGRAMME: REHABILITATION

CHAPTER 7

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

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

7.1. Objectives

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

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 dense initial grass or other perennial cover 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 render the ecosystem more prone to erosion and irreversible degradation» Disturbance of indigenous vegetation creates opportunities for

	<p>the establishment of invasive vegetation or creation of surfaces that do not support the permanent (re-) establishment of vegetation</p> <ul style="list-style-type: none"> » 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		
<p>Prior to the application of topsoil</p> <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	During and after construction
<p>Application of topsoil</p> <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 » care shall be taken to prevent the compaction of 	Contractor	During and after construction

Mitigation: Action/Control	Responsibility	Timeframe
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 renovated 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"> ○ 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	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	After construction
Re-vegetation		
<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	Construction phase Operational phase, followed up until desired end state is reached
Re-seeding	Contractor	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"> * previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools * commercially available seed of grass species naturally occurring on site can be used as alternative » re-seeding shall occur at the recommended time to take advantage of the growing season » in the absence of sufficient follow-up rains after seeds started germinating, irrigation of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank 		phase Operational phase, followed up until desired end state is reached
Planting of species <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 	Contractor	Construction phase Operational phase, followed up until desired end state is reached
Traffic on revegetated areas <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 	Contractor	Construction phase Operational phase
Establishment <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"> o Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created 	Contractor	Construction phase Operational phase, followed up until desired end state is reached

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 & specialist during construction, suitable designated person / contractor thereafter	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 EMP. » 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 EMP.

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 **Operations Manager** will:

- » Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMP.
- » Conduct annual basis reviews of the EMP 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: Limit the ecological footprint of the facility

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	Presence of maintenance staff and operation of the facility
Potential Impact	Impact on the surrounding landscape due to alien plant invasion, erosion or poor management with the facility.

Activity/Risk Source	<ul style="list-style-type: none"> » Alien plants within the facility » Unregulated runoff from the facility » Human presence » Maintenance activities which may lead to negative impacts such as pollution, herbicide drift etc.
Mitigation: Target/Objective	Low ecological footprint of the facility during operation

Mitigation: Action/Control	Responsibility	Timeframe
Access to the site should be controlled to the actual facility	Developer / contractor	Operation
Vegetation control should be by manual clearing or the use of livestock. Herbicides should not be used.	Developer / contractor	Operation
Bi-annual monitoring for alien plant species - with follow up clearing	Specialist	Operation
Quarterly site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified	Developer / contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » No erosion problems within the site or from access roads » Maintenance of a ground cover of perennial grasses and forbs that resist erosion.
Monitoring	<ul style="list-style-type: none"> » Records of alien species presence and clearing actions » Records of erosion problems and mitigation actions taken with photographs » Management log detailing the management actions taken to maintain and control the vegetation within the facility.

c) OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the Proposed Solar Energy Facility

Project Component/s	Solar energy facility and ancillary infrastructure (i.e. the power line, substation, access roads and fencing).
Potential Impact	Visual impact of facility degradation and vegetation rehabilitation failure.
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site).
Mitigation: Target/Objective	Well maintained and neat facility.

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility as a whole.	Developer / operator	Throughout the operational phase.

Mitigation: Action/control	Responsibility	Timeframe
Maintain roads to forego erosion and to suppress dust.	Developer / operator	Throughout the operational phase.
Maintain servitudes to forego erosion and to suppress dust.	Developer / operator	Throughout the operational phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Developer / 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 on-going basis (by operator).

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

The soil on site is likely to be impacted in terms of:

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

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

Project Component/s	<ul style="list-style-type: none"> » PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.

Activities/Risk Sources	<ul style="list-style-type: none"> » Poor rehabilitation and/or 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	<ul style="list-style-type: none"> » Inspections of site on a bi-annual basis by the environmental manager

e) 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 lead to dust creation.

Project Component/s	<ul style="list-style-type: none"> » Hard engineered surfaces. » On-site vehicles.
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and the augmentation plant.
Activities/Risk Sources	<ul style="list-style-type: none"> » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.

Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.
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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.
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Monitoring	<ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.
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f) OBJECTIVE: Ensure the implementation of an appropriate fire management plan during the operation phase

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

Project Component/s	» Operation and maintenance of the solar energy facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the solar energy facility infrastructure.

Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Join the local Fire Protection Agency.	Operator	Operation
Provide adequate fire fighting equipment on site.	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.	Built Environment Africa Energy Services (Pty) Ltd / 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	» Developer South Africa (Pty) Ltd must monitor indicators listed above to ensure that they have been met.

g) 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 30 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 30 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 30 permanent staff is likely to be based in Vryburg. Developer should commit to implementing a 5-year training and skills development and training programme to maximise employment for locals.	Operator	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.	Operator	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	» Developer must monitor indicators listed above to ensure that they have been met for the operational phase.

h) 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.	Built Environment Africa Energy Services (Pty) Ltd / Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	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 bunded area. Should any accidental spillage take place, it	Operator	Operation and maintenance

Mitigation: Action/Control	Responsibility	Timeframe
must be cleaned up according to specified standards regarding bioremediation.		
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: » 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	Operator	Operation
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 require this section of the EMP 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. However, the number of people affected (30) is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/Risk Source	» Decommissioning of the PV facility
Mitigation: Target/Objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV facility.

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

Performance Indicator	» South African Labour legislation relevant at the time
Monitoring	» Developer South Africa and Department of Labour

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

Project Component/s	Solar energy facility and ancillary infrastructure (i.e. the power line, substation, access roads and fencing).
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 (i.e. within 2 km of 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. This may include the roads, substation, fencing, ancillary buildings etc.	Developer/ operator	During the decommissioning phase.
Rehabilitate access roads not required for the post-decommissioning use of the site. Consult an ecologist to give input into rehabilitation specifications.	Developer/ operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and	Developer/ operator	Post decommissioning.

Mitigation: Action/control	Responsibility	Timeframe
implement remedial action as and when 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 EMP

CHAPTER 10

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

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

GRIEVANCE MECHANISM / PROCESS

AIM

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

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

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

Proposed generic grievance process

- » Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- » A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
- » Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who 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 be of the opinion that legal action be the most appropriate option.

**APPENDIX B:
GUIDELINES FOR INTEGRATED MANAGEMENT OF
CONSTRUCTION WASTE**

ENVIRONMENT PROCEDURE

Waste Management Plan

Table of Contents

1. Introduction	4
a. Purpose of this document.....	4
b. Scope	4
c. Waste Management Strategy	4
d. Waste generation	5
2. Legal Requirements.....	5
3. Definations and Abbreviations.....	6
a. Defination of waste relevant to operations	6
b. Abbreviations	7
4. Responsibilities	8
5. General Waste	8
a. Management of General waste	8
b. General Waste Streams	8
i) Compactable General Waste	8
ii) Un-compactable General Waste	8
c. Recycling Procedure	9
6. Hazardous waste	9
a. Management of Hazardous waste.....	9
b. Hazardous waste types	9
7. Waste Containers	9

a.	Waste Container conditions.....	9
b.	Inspection of containers	9
c.	Placement of Waste Containers.....	9
8.	Waste storage areas and collection points	10
a.	Specifications of waste storage areas	10
i)	General waste storage area	10
ii)	Hazardous waste storage area.....	10
b.	Requirements of collection points	10
c.	Waste removal schedule	10
d.	Operations of waste removal system	10
9.	General Rules	11
a.	Records	11
b.	Review	11
c.	Reporting	11
10.	Conclusion	11
11.	References	11

Introduction

Sound waste management is better achieved when an Integrated Waste Management System is implemented. This is more evident on sites or in areas where different parties and aspects are involved. Integrated Waste Management is better achieved when system is underlined by sound environmental principles. These principles derived from section 2 of the National Environmental Management Act (Act 107 of 1998). The following principles apply to waste management.

A Precautionary approach will be followed in the sense that harm to health and the environment is prevented when waste is generated, treated and disposed off. Kgalatsane Solar (Pty) Ltd as the generator of waste have to abide by the Duty of Care principle by ensuring that waste is disposed off in a manner that is environmentally sound and responsible. Management of waste must also follow an Integrated and Holistic Approach integrating health, safety and the environment in to the management approach and managing all aspects as a whole. By following the Best Practical Environmental Option one selects and implements the most sustainable management option in terms of the environment and the people surrounding it. The last principle that has to be considered in waste management is the Polluter Pays principle. This principle indicates that the costs for remediation and prevention of further pollution will fall on the responsible party.

Purpose of this document

A Waste Management Plan plays a key role in achieving sustainable waste management. This document is set to indicate the procedure that has to be followed during the handling, storage, transportation and disposal of waste that is generated from the activities on site.

Scope

The Waste Management Plan Procedure provides guidelines for waste management and applicable to employees, sub-contractors working on behalf of Built Environment Africa Energy Services (Pty) Ltd, Kgalatsane Solar Energy Facility.

Waste Management Strategy

Waste will be managed according to the waste hierarchy as set in the National Environmental Management: Waste Act (Act 59 of 2008).The waste hierarchy dictates that the generation of waste should be avoided and minimised. If this is not possible the most desirable options will be reuse, recycle and recover waste. The last option will be disposal.

When waste is disposed it must be done in an environmentally safe manner and at a disposal site that is permitted and authorised to dispose of that waste. It is the generators duty to ensure that such disposal sites have sound and responsible management practices.

Waste will be segregated at source to facilitate re-use, recycling, and recovery. Segregation of waste will be made possible by means of waste containers that are allocated and marked for different waste streams that are identified within the content of this document.

Emergency Procedures will be followed in the unforeseen event of a spill or if waste burns on site (Emergency preparedness and Response Plan).

All employees will receive training on waste management issues by means of induction training and toolbox talks that will take place once per week. Littering on site is prohibited. No person is allowed to discard of any litter on site except in bins provided for that purpose.

Waste generation

Daily operational activities will generate general waste, metal waste as well as hazardous waste on monthly basis. Figures of these wastes are not yet known and will vary within project cycles as there will be times of acceleration in activity and times decreased activity.

Sources of waste will include: empty containers, office paper, plastic water bottles, and food waste canteens, printer cartridges, and used vehicle oil from workshops.

Legal Requirements

The following sources of South African Law have been identified and will form the basis of the (WMP). Built Environment Africa Energy Services (Pty) Ltd will comply with all environmental policies or Acts that apply to the Project, and the Project Manager should familiarize himself with, and have access to, the following pieces of legislation as a minimum:

- » Constitution of South Africa (Act No. 108 of 1996);
- » National Environmental Management Act (Act 107 of 1998);
- » National Environmental: Waste Act (Act No. 59 of 2008);
- » Hazardous Substances Act (Act No. 15 of 1973);
- » Impacts and Aspects Register;
- » Kgabalatsane Solar Energy Facility Environmental Management Programme (EMPr)

- » Minimum Requirements for the Disposal of Waste by Landfill, Edition 3 (2005); and
- » Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste, Edition 3 (2005).

Definitions and Abbreviations

a. Definition of waste relevant to operations

Environment Surroundings within which human exists and that are made up of:

- The land, water and atmosphere of the earth;
- Micro- organisms, plant and animal life;
- Any part or combination of the above and the interrelationships among and between them; and
- The physical, chemical, aesthetic and cultural properties and conditions of foregoing that influence human health and well-being. (NEMA Act, Act No. 107 of 1998).

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

- a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
- b) which the generator has no further use of for the 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, but:
 - i) a by-product is not considered waste; and
 - ii) any portion of waste, once re-used, recycled and recovered, ceases waste.

Hazardous Means a source of or exposure to danger (NEMA, 1998)

Recovery Means the controlled extraction of a material or the retrieval of energy from waste to produce a product

Recycle a process where waste is reclaimed for further use, which process involves the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material.

Re-use to utilise articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles

Container means a disposable or re-usable vessel in which waste is placed for the purposes of storing, accumulating, handling,

transporting, treating or disposing of that waste, and includes bins, bin –liners and skips

Disposal Means the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into air or any land.

Hazardous Waste Waste that has the potential to cause a negative threat/impact to humans and/or the environment. It includes, but is not limited to, batteries, neon lights, fluorescent lights, printer cartridges, oil, paint, paint containers, oil filters, IT equipment etc.

General waste Waste which does not pose an immediate hazard or threat to health or to the environment' and includes the following waste flows: domestic waste, construction and demolition waste, business waste, insert waste.

EMP Environmental Management programme. A detailed plan of action prepared to ensure that recommendations for preventing the negative environmental Impacts and where possible improving the environment are implemented during the life cycle of the project. (Kgabalatsane Solar Energy- project EMPr).

b. Abbreviations

ECO	Environmental Control Officer
EMP	Environmental Management Plan
WMP	Waste Management Plan
NEM: WA (Act 59 of 2009)	National Environmental Management: Waste
DWA	Department of Water Affairs
I&AP	Interested and Affected Parties/Person

Responsibilities

- i) The Built Environment Africa Energy Services (Pty) Ltd Environmental Officer shall be responsible for compliance with this waste management plan and ensure that all waste generated during construction activities on site is managed in safely and in accordance with legislations..
- ii) Built Environment Africa Energy Services (Pty) Ltd EO shall provide the Team HSE and ECO with a written monthly waste report, detailing both compliance with the environmental Specifications as well as Environmental Performance;
- iii) It is the responsibility of all employees to segregate at source and store waste in the appropriate bins and in designated areas and to ensure that waste is kept to a minimum and environment is not polluted and contaminated.

General waste

a. Management of general waste

General waste will be segregated at source and placed in the correct waste bins designated for each waste stream. General waste will not be stored on site for longer than 30 days and will be collected and emptied on a weekly basis by waste management company for disposal.

b. General waste stream

This is waste that does not pose an immediate threat to health or the environment. Most of these waste streams will be designated to be re-used, recycled and recovered.

i) Compactable General waste

This is any waste type that are small in size and that can be compacted

- General waste: waste that does not fall within the defined waste streams that will be disposed of in landfill. Domestic waste will be discarded in waste bins that are labelled "General Waste". Source of this waste will be kitchen, beverage cans, plastic waste and cartons.
- Waste papers: These are waste paper boxes that are unwanted. This waste will be discarded in waste bins labelled "Waste paper, Boxes"

ii) Un-compactable general waste

This is waste that is large in size that cannot be disposed of in normal waste bins or skip. Most of the waste types in this category can be recycled or re-used within the operations on a construction site or can be recycled in to the local community.

- Scrap metals: all metal or steel that is discarded or termed off-cuts will form the bulk of the scrap metal waste stream. These metals will be placed in waste bins labelled "Metal Waste"

c. Recycling Procedure

All scrap/metal waste generated will be collected and sent to the recycling facilities for recycling purpose. Used oil shall be collected by recycling companies where applicable.

Hazardous waste

a. Management of hazardous waste

Hazardous waste will be stored in a safe and responsible manner. Hazardous waste will not be stored on site for more than 30 days. This hazardous waste will be placed in a waste bin labelled "Hazardous Waste" and will be collected and disposed of as Hazardous waste at approved landfill site. All hazardous

waste types will be identifiable at all times. Incompatible waste type will be stored separately.

b. Hazardous waste types

- Hydrocarbon contaminated materials: such as soil due to spills and oil leaks;
- Used equipments/vehicles oils: from vehicles being serviced at workshop;
- Printing cartridges; and
- Chemical waste (such as used oil, paint, insecticide).

Waste bins

a. Waste bins conditions

Built Environment Africa Energy Services (Pty) Ltd will ensure that the waste bins used are suitable for the waste that is to be stored within. The waste bins will be in a good condition, not be corroded and may not permit leachate or be otherwise unfit for the safe storage of waste designated to that container. Bins will have mechanisms in place to prevent waste from becoming wind blow litter and it must be scavenger proof. Hazardous waste bins will be sealed to ensure that no spillages can occur. These bins will be also be labelled so as to identify type of waste, date of storage commencement and generator details.

b. Inspections of waste bins

Waste bins will be inspected on a daily basis to ensure that they remain in an acceptable condition for safe storage of waste. These inspections will be documented and records will be kept for future references.

c. Placement of waste bins

The bins will be placed in centralised locations in order to ensure that it is accessible to all employees. The waste bins will be emptied and the waste will be taken to the relevant designated areas (the central storage area or the waste transfer station) awaiting collection by waste removal companies.

Waste storage areas and collection points

a. Specifications of waste storage areas

Waste will be managed in such a way as to prevent it from becoming a nuisance such as odor and to prevent the breeding of vermin and vectors. Management practices will ensure that no environmental harm is caused. All waste area will be clearly marked with signs to specify that waste is being stored in that area and to indicate what the nature of waste is. Storage areas will be fenced with access control to prevent unauthorised access.

i) General waste storage areas

Storage areas for general waste will be kept clean and neat, with a high level of housekeeping.

ii) Hazardous waste storage areas

Storage areas for hazardous waste will be having a roof to divert rain water from waste containers and must be fully bunded (110%) with pollution collection measurements in place in case of any spills or leakages. A high level of house keeping must be maintained in and around the storage. A file with (MSDS) documents and waste acceptance forms must be kept on site.

b. Requirements of collection points

Points from which waste is collected to be taken to the storage areas or the transfer stations will be clearly accessible for vehicles.

d. Waste removal schedule

Waste bins will be emptied on a regular basis. This will either be daily, weekly or when bins have reached their capacity. A call for service will be issued to the waste removal company when bins are full.

General rules

a. Records

All waste removal records will be maintained on site where it is accessible to all interested and affected parties. These records will include an updated list of the waste streams and volumes generated and disposed of, all collection certificates and disposal certificate and all material recycled or re-used and the volume thereof.

b. Review

Built Environment Africa Energy Services (Pty) Ltd Project Manager and Built Environment Africa Energy Services (Pty) Ltd Environmental Officer will review this Waste Management Plan on a monthly basis.

c. Reporting

Waste disposal figures will be reported on a monthly basis to the HSE and ECO.

Conclusion

Compliance and implementation of this procedure will ensure effective management of waste on site. Built Environment Africa Energy Services (Pty) Ltd and their sub-contractors will comply with the requirements of the EMP, the project RoD and other legislative requirements that may have an impact on waste management in general.

References

- ISO 14001:2004;
- Kgabalatsane Solar Energy Facility Environmental Management Programme (EMPr)