
PROPOSED CAMCO CLEAN ENERGY 100KW SOLAR SYSTEM AT THABA ECO HOTEL, JOHANNESBURG, GAUTENG

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the Basic Assessment Report

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PROJECT DETAILS

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| | : | |
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DEFINITIONS AND TERMINOLOGY

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

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 60 years, including artefacts, human and hominid remains and artificial features and structures.

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

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

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

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

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

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

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and

- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

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

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

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

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

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

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

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

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

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

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

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

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

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

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PROJECT DETAILS

CHAPTER 1

Camco Clean Energy (Pty) Ltd is proposing the development of a small-scale 100kW photovoltaic (PV) solar system at the Thaba Eco Hotel in Gauteng. The facility is proposed to be on the farm Rietvlei 101 IR adjacent to the Klipriviersberg Nature Reserve. The proposed development will be located approximately 10km south of Johannesburg CBD and falls within the jurisdiction of the City of Johannesburg Metropolitan Municipality (refer to Figure 1.1).

The purpose of the project is to generate and supply a stable source of energy for the Thaba Eco Hotel itself. The development site for the proposed project is currently a designated conservation area and is surrounded by quartzite ridges of the Klipriviersberg and peaks of the Kliprivier Valley and is accessible from Impala Road.

The solar energy system will have a development footprint of less than 1ha, within which the following typical infrastructure will be established:

- » Arrays of photovoltaic (PV) panels with a generation capacity of up to 100kW.
- » Mounting structures to be either rammed steel piles, piles with pre-manufactured concrete footing or rock anchors with steel cables to support the PV panels.
- » Cabling between the project components, to be laid underground.
- » Inverter enclosures.
- » Battery storage: REDT 15 kW/240 kWh containerised 20ft shipping container. This battery contains low acidic sulphuric acid with vanadium.

Through the environmental assessment of impacts associated with the Thaba Eco Hotel Solar System, both potentially positive and negative impacts were identified. All impacts were assessed to be of medium-low significance. Power from the PV panels will be sent to the storage system. Thereafter it can be transferred to the hotel substation to provide power to the hotel.

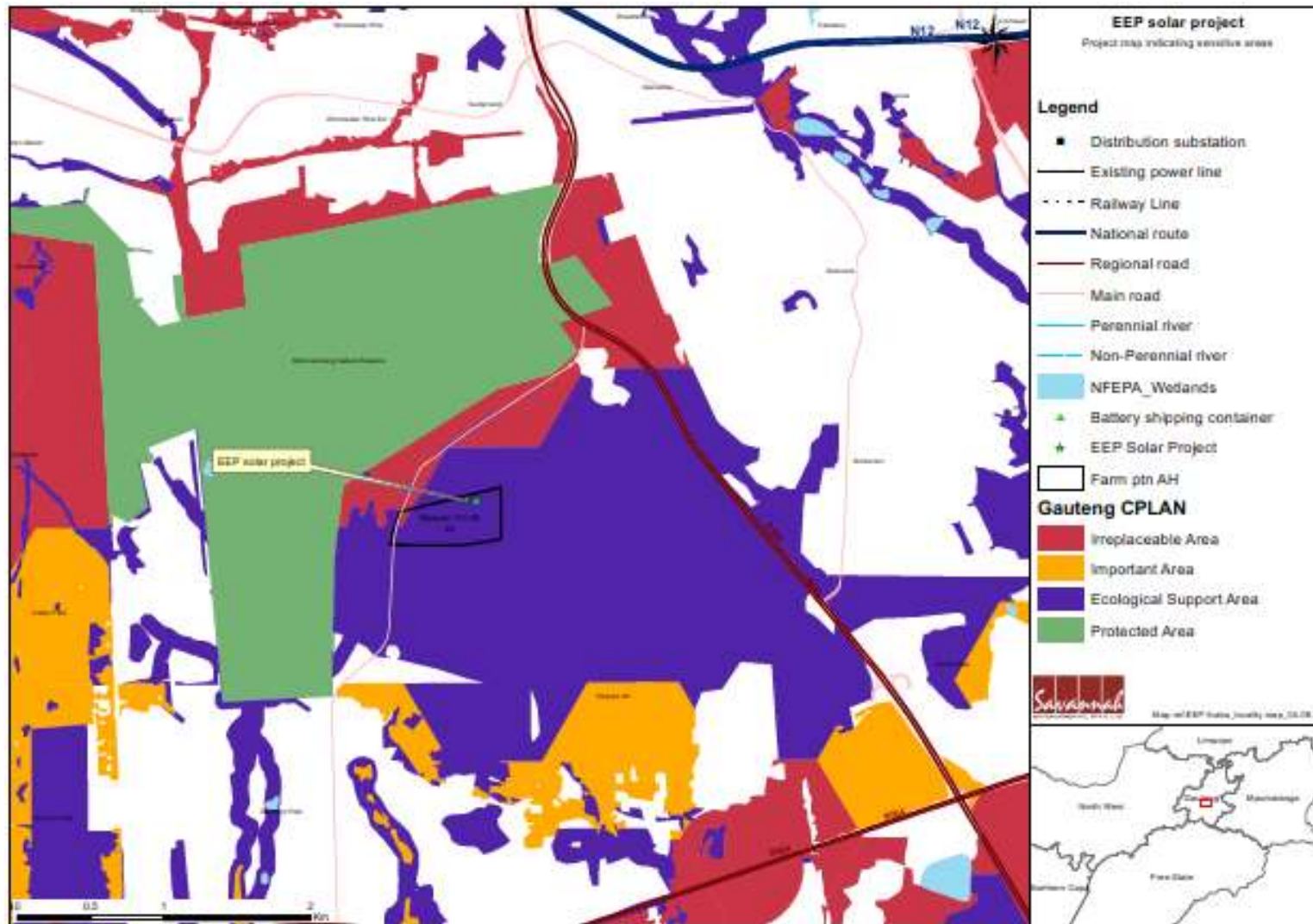


Figure 1.1: Locality map showing the development area for the proposed Camco Clean Energy 100kW Solar System at Thaba Eco Hotel.

1.1. Activities and Components associated with the Construction Operation and Decommissioning Solar Energy Facility

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

| Main Activity/Project Component | Components of Activity | Details |
|---|--|--|
| Planning | | |
| Conduct technical surveys | <ul style="list-style-type: none"> » Geotechnical survey by geotechnical engineer. » Site survey and confirmation of the infrastructure micro-siting footprint. | » All surveys are to be undertaken prior to initiating construction. |
| Construction | | |
| Undertake site preparation | <ul style="list-style-type: none"> » Clearance of vegetation at the infrastructure footprints. » Where required, some levelling of the land may occur. » Excavation of trenches for underground cables. | » These activities will require the stripping of topsoil, which will need to be appropriately stockpiled for use in rehabilitation. |
| Construct infrastructure foundations | » Mounting structures will either be pile driven, screwed, rock anchored steel cables or pre-cast concrete footings | » Mounting structures will not involve the utilization of poured concrete, but would involve be pile driven, screwed |
| Transport of components and equipment to site | <ul style="list-style-type: none"> » Trucks will be used to transport all components to site: * The normal civil engineering construction equipment for the civil works (e.g. trucks, graders, compaction equipment, cement mixers, etc.). | » The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself. |
| Establishment of PV panels | <ul style="list-style-type: none"> » PV panels are transported in containers. » The steel structures will be assembled on site. | » The steel mounting structures, manufactured in South Africa, are custom made for the site. They are assembled on site. |
| Connection of PV panels | » The PV panels will be connected to the hotel substation via underground cabling (where practical). | » The installation of these underground cables will require the excavation of trenches of approximately 1000 mm deep within which |

| Main Activity/Project Component | Components of Activity | Details |
|---------------------------------|--|---|
| | | they can then be laid. |
| Undertake site rehabilitation | <ul style="list-style-type: none"> » Remove all construction equipment from the site. » Rehabilitation of temporarily disturbed areas where practical and reasonable. | <ul style="list-style-type: none"> » On full commissioning of the system, any access points to the site which are not required during the operation phase will be closed and rehabilitated. |
| Operation | | |
| Operation | <ul style="list-style-type: none"> » PV panels. » Associated infrastructure. | <ul style="list-style-type: none"> » The operational phase is proposed to run for a period of approximately 20 years. » During this time, maintenance, supervision, and monitoring teams will be required on site. » The PV system will be operational during daylight hours only but not under circumstances of mechanical/electrical breakdown, or maintenance activities. » Energy storage mechanism such as a battery which would allow for continued generation at night or on cloudy days are proposed. |
| Maintenance & Security | <ul style="list-style-type: none"> » Maintenance during the life cycle of the facility would include emergency repairs, routine panel maintenance, routine maintenance of medium voltage equipment and maintenance of the site. | <ul style="list-style-type: none"> » The panels will be cleaned with water. It is estimated that this would be required twice annually. |
| Decommissioning | | |
| Site preparation | <ul style="list-style-type: none"> » Preparation of the site. » Mobilisation of decommissioning equipment. | <ul style="list-style-type: none"> » Depending on the economics of the development following the operational period, the plant will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to continue, existing components may be disassembled and replaced with technology/ infrastructure available at that time. However, if the |

| Main Activity/Project Component | Components of Activity | Details |
|---------------------------------|--|---|
| | | decision is made to decommission the facility the components of the facility will be disassembled and removed from the site. |
| Disassemble panels | » The panels will be disassembled and removed. | » The components of the plant will be disassembled and removed. Thereafter they will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements. The site will be rehabilitated and can be returned to the agricultural or other land-use. |

1.2 Findings of the Environmental Impact Assessment

Potential environmental impacts (positive and negative) associated with the Camco Clean Energy Solar System have been identified through the environmental assessment and includes:

- » Impacts on ecology (project is located within a designated conservation area)
 - » Impacts heritage and Paleontological Resources
 - » Impacts on the local soils, land capability and agricultural potential of the site.
-
- » In terms of the **ecology** survey, the impact of the construction and operation of the proposed facility is likely to be of **low significance**. The site for the proposed Solar System is situated in a Medium-Low Sensitive area and will most likely not be impacted by the development. The proposed site falls within the Andesite Mountain Bushveld. Within this vegetation type the Klipriver Highveld Grassland ecosystem is classified as critically endangered. According to the Ecological Specialist Report, the development will have little effect on the status and original extent of the Klipriver Highveld Grassland ecosystem. This is due to the relative small size of the footprint area, the location of the development site that is an already disturbed area and the restricted ability to contribute to the general functioning of this ecosystem. Two Red and Orange species have been identified at the site namely *Hypoxis hemerocallidea* (African Potato) and *Boopane disticha* (Bushman Poison Bulb). Both of these species were sparsely distributed within the development area and with the appropriate mitigation measures, the impact on these species are considered as low. During the fauna survey, signs of small mammal activities were present. These species will most likely move away during the construction phase and thus the impact on mammals can be regarded as low. In terms of reptiles, only one red data species namely the Striped Harlequin Snake was observed. The development will result in habitat loss and it is highly likely that this species and other reptiles will either migrate away or will use the panels and support structures for shelter and habitat.
-
- » **Heritage:** During the survey for the proposed PV solar system, **no sites of heritage significance** were found in the development footprint. Widely dispersed MSA flakes made on quartzite were found, but are too isolated and scattered to be of any significance. The impacts of the proposed development on heritage resources such as archaeological sites, built structures over 60 years old, sites of cultural significance associated with burial grounds and graves, graves of victims of conflict, and significant cultural landscapes or viewsapes are considered to be **low**. If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum and/or

the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/ excavation can be undertaken.

- » **Cumulative impacts:** the cumulative impacts on ecology, heritage, soil and agriculture is expected to be of low significance considering the limited size of the proposed infrastructure as well the already disturbed landscape in which it is being proposed.

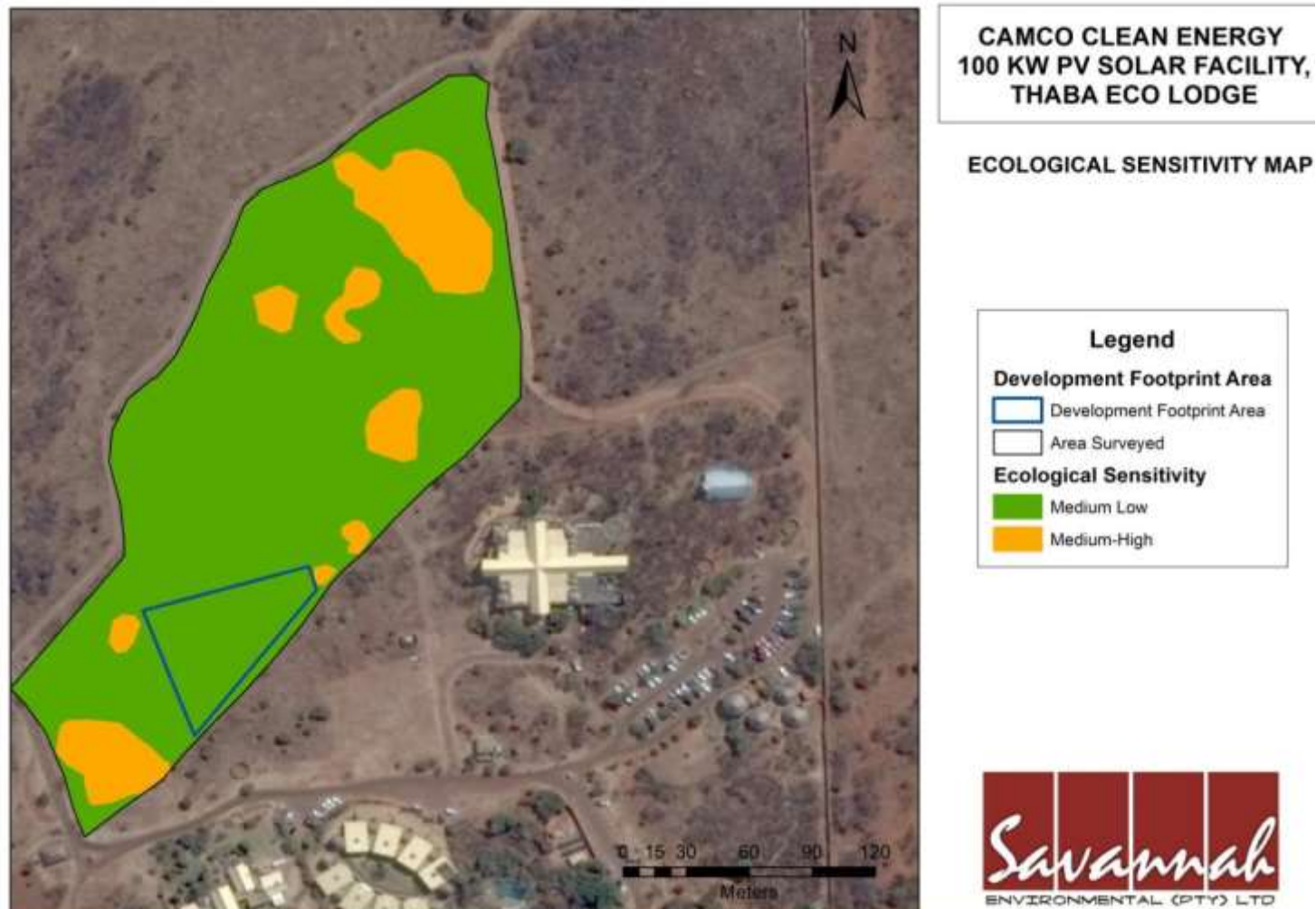


Figure 1.2: Environmental Sensitivity map for the proposed Thaba Eco Hotel solar system.

1.3. Benefits of the Proposed Project

The main purpose of the project is to produce a stable source of power to the Hotel itself. Through pre-feasibility assessments and research, the viability of establishing a 100kW Solar energy system at the Thaba Eco Hotel has been established by **Camco Clean Energy**. The positive implications of establishing a solar energy system at the Eco Hotel within Gauteng include:

- » The potential to harness and utilise good solar energy resources would be realised.
- » Promotion of clean, renewable energy in South Africa.
- » Creation of local employment during the construction phase for the area.

PV installations convert solar energy into electricity, and therefore no fuel consumption occurs during the operational phase. 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 be used at the Thaba Eco Hotel. This generation of renewable power will aid in reducing the dependency on other power generation fuels.

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.”¹ The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

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

This Construction and Operational Environmental Management Plan (CEMP and OEMP) has been compiled for the proposed Thaba Eco Hotel solar system. 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 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).

¹ Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

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 Basic Assessment process.

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

Camco Clean Energy (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 implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the Basic Assessment process for the proposed Thaba Eco Hotel solar system, it is important that this document be read in conjunction with the final Basic Assessment Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

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

STRUCTURE OF THIS EMPr

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

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

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

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

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

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

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

3.1. Project Team

This draft EMPr was compiled by:

| | Name | Company |
|------------------------|---|--|
| EMPr Compilers: | Jo-Anne Thomas Thalita Botha John von Mayer | Savannah Environmental |
| Specialists: | Gerhard Botha Jaco van der Walt | Savannah Environmental Heritage Contracts and Archaeological Consulting |

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

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

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

- » National Environmental Management Act (Act No 107 of 1998).
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR 982 in Government Gazette 38282 of December 2014).
- » Guidelines published in terms of the NEMA Basic Assessment Regulations, in particular:
 - * Integrated Environmental Management Information Series (published by DEA).
- » International guidelines, including the Equator Principles.

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

Table 4.1: Relevant legislative and permitting requirements applicable to the establishment of the proposed Solar System

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|--|---|--|---|
| National Legislation | | | |
| National Environmental Management Act (Act No 107 of 1998) | <p>The Environmental Assessment Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations.</p> <p>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>In terms of the 2014 EIA regulations, a Basic Assessment Process is required to be undertaken for the proposed project.</p> | Gauteng Department of Agriculture and Rural Development (GDARD) | The listed activities triggered by the proposed solar energy facility have been identified and assessed in the Basic Assessment Process being undertaken. This Basic Assessment Report will be submitted to the competent and commenting authority in support of the application for authorisation. |
| National Environmental Management Act (Act No 107 of 1998) | <p>In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.</p> <p>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p> | Department of Environmental Affairs Gauteng Department of Agriculture and Rural Development (GDARD) | While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the Basic Assessment Process through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project. |
| Environment Conservation | National Noise Control Regulations (GN R154 dated 10 January | Department of | Noise impacts are expected |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|--|---|--|---|
| Act (Act No 73 of 1989) | 1992) | Environmental Affairs Department of Environmental and Nature Conservation (DENC) Local Authorities | to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 6:00pm, Weekdays (excluding public holidays) and 6:00am - 1:00pm, on Saturdays. Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified. |
| National Water Act (Act No 36 of 1998) | Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required). Consumptive water uses may include the taking of water from a water resource - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or | Department of Water and Sanitation | The water required for this project will be sourced from Johannesburg Local Municipality. No License would be required from DWA for the taking of water. |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|--|---|---|---|
| | characteristics of a watercourse - Section 21i. | | No water resources will be impacted by the project and therefore there is no requirement for a water use license. |
| National Environmental Management: Air Quality Act (Act No 39 of 2004) | <ul style="list-style-type: none"> » S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas" » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act. » Dust control regulations promulgated in November 2013 may require the implementation of a dust management plan. | Department of Environmental Affairs | While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project. The Air Emissions Authority (AEL) may require the compilation of a dust management plan. |
| 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 paleontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of | South African Heritage Resources Agency | An HIA has been undertaken as part of the Basic Assessment Process to identify heritage sites. |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|--|--|
| | archaeological sites as part of tourism attraction (S44). | | |
| National Environmental Management: Biodiversity Act (Act No 10 of 2004) | <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: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » 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. | Department of Environmental Affairs GDARD | <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>A specialist ecology study has been undertaken as part of the Basic Assessment Process. No critically endangered, endangered, vulnerable, and protected species listed in terms of this Act were identified within the development area.</p> |
| Conservation of Agricultural Resources Act (Act No 43 of 1983) | <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. | Department of Agriculture, Forestry and Fisheries (DAFF) | This Act will find application throughout the life cycle of the project. In this regard, soil erosion |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|---|---|--|---|
| | <ul style="list-style-type: none"> » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048). » Requirement to implement soil conservation measures. | | prevention and soil conservation strategies must be developed and implemented. In addition, a, erosion control and weed control and management plan must be implemented. |
| National Forests Act (Act No. 84 of 1998) | According to this act, the Minister has declared a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. | Department of Agriculture, Forestry and Fisheries (DAFF) | There are no protected trees on site |
| National Veld and Forest Fire Act (Act 101 of 1998) | <p>In terms of S12 the landowner must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.</p> <p>In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.</p> | Department of Agriculture, Forestry and Fisheries (DAFF) | While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project. |
| Hazardous Substances Act (Act No 15 of 1973) | 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. | Department of Health | It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|--|---|---|--|
| | <p>Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance</p> <p>Group IV: any electronic product; and 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>license is required to be obtained from the Department of Health.</p> |
| <p>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)</p> | <p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. <p>In terms of the Regulations published in terms of this Act (GN 921), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> | <p>National Department of Environmental Affairs (hazardous waste)</p> <p>Provincial Department of Environmental Affairs (general waste)</p> | <p>As no waste disposal site is to be associated with the proposed project, no permit is required in this regard.</p> <p>Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act.</p> |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|--|--|--|--|
| | <ul style="list-style-type: none"> » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unfit for the safe storage of waste; » Adequate measures are taken to prevent accidental spillage or leaking; » The waste cannot be blown away; » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented. | | |
| <p>National Road Traffic Act (Act No 93 of 1996)</p> | <ul style="list-style-type: none"> » The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations. | <ul style="list-style-type: none"> » South African National Roads Agency Limited (national roads) » Provincial Department of Transport | <p>An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads.</p> |
| Provincial Legislation and Plans | | | |
| <p>Draft Gauteng Nature Conservation Bill (2014)</p> | <p>Once promulgated, the new Act will seek to:</p> <ul style="list-style-type: none"> » align provincial legislation with the provisions of the Constitution | <p>GDARD</p> | <p>Not yet enacted.</p> |

| Legislation | Applicable Requirements | Relevant Authority | Compliance Requirements |
|-------------|---|--------------------|-------------------------|
| | <p>of the Republic of South Africa, 1996 particularly section 33 (the right to just administrative action) and the Promotion of Administrative Justice Act, 2000.</p> <ul style="list-style-type: none"> » align provincial legislation to national environmental legislation such as the National Environmental Management Act, 1998 and the National Environmental: Biodiversity Act, 2004 and strengthen national legislation. » remove certain provisions from the current Nature Conservation Ordinance, 1983 that are now catered for in national legislation to avoid duplication of functions between national and provincial government. » remove provisions in the Nature Conservation Ordinance, 1983 (Ordinance) that are now obsolete. » align enforcement provisions in particular penalties with current environmental trends. » provide for Gauteng specific nature conservation issues that are not addressed in National legislation and/or were previously excluded in the Ordinance. | | |

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 community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Enables the solar energy system construction activities to be undertaken without significant disruption to other land uses and activities in the area.

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

5.1 Objectives

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

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

| | |
|-------------------------------------|---|
| Project Component/s | <ul style="list-style-type: none"> » PV panels » Battery |
| Potential Impact | <ul style="list-style-type: none"> » Impact on identified sensitive areas |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Positioning of all the facility components. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » The design of the facility responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|------------------------------|------------------|
| Undertake a detailed geotechnical survey prior to the commencement of construction. | Geotechnical specialist | Design |
| Obtain any additional environmental permits required (e.g. permit to impact on protected plant species, etc). | Camco Clean Energy (Pty) Ltd | Project Planning |
| Compile a comprehensive erosion and storm water | Camco Clean | Design |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|--|------------------|
| management plan for hard surfaces as part of the final design of the project (refer to Appendix C for principles to be considered). This must include appropriate means for the handling of storm water within the site, e.g. separate clean and dirty water streams around the plant, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the panels). | Energy (Pty) Ltd | |
| The facility should be designed in such a manner to allow surface and subsurface movement of water along drainage lines so as not to obstruct natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water. | Engineering design consultant and Camco Clean Energy (Pty) Ltd | Design |
| Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and relevant appendices. | Camco Clean Energy (Pty) Ltd | Design review |
| Minimise the footprint of the PV system and the associated infrastructure as far as possible. | Camco Clean Energy (Pty) Ltd | Pre-construction |
| A traffic management plan must be prepared for site access roads to ensure no hazards result from increased traffic and that traffic flow is not adversely affected. | Camco Clean Energy (Pty) Ltd | Pre-Construction |
| Submit a final layout to GDARD prior to the commencement of construction. | Camco Clean Energy (Pty) Ltd | Pre-Construction |
| The terms of this EMPr and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts | Camco Clean Energy (Pty) Ltd and EPC | Tender process |

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

OBJECTIVE 2: Minimise storm water runoff (guideline for storm water management plan)

Management of storm water will be required during the construction phase of the facility. 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 phase.

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

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|------------------------------|----------------------------|
| A Method Statement for the management of storm water which also considers the recommendations below is to be submitted to the ECO for review prior to commencement of construction activities. | Camco Clean Energy (Pty) Ltd | Pre-construction |
| Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system as a result of increased sedimentation through the implementation of appropriate erosion management measures. | Camco Clean Energy (Pty) Ltd | Planning and design |
| Appropriately plan hard-engineered bank erosion protection structures. | Camco Clean Energy (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 =. | Camco Clean Energy (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. | Camco Clean Energy (Pty) Ltd | Planning and design |

| | |
|------------------------------|--|
| Performance Indicator | » Sound water quality and quantity management during construction and operation. |
| Monitoring | » ECO monitoring on a monthly basis |

OBJECTIVE 3: Search and Rescue of All Protected Plants

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

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

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|-----------------------|-----------------------|
| Search and Rescue (S&R) of identified protected plant species occurring in long term & permanent, hard surface development footprints should take place. All such development footprints must be surveyed and pegged out as soon as possible, and then an ecologist with Search and Rescue experience should be appointed to undertake the S&R. All rescued plants must be transplanted to suitable areas outside of the development footprint. | Contractor | Prior to construction |

| | |
|------------------------------|---|
| Performance Indicator | » Rescue of protected plant species prior to commencement of construction. » Replanting in suitable areas outside of the development area. |
| Monitoring | » ECO to monitor Search and Rescue and re-establishment of transplanted individuals. » |

MANAGEMENT PROGRAMME: CONSTRUCTION

CHAPTER 6

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

- » Ensures that construction activities are appropriately 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 indigenous natural vegetation and habitats of ecological value (i.e. project is located within a designated conservation area).
- » Minimises impacts on fauna which currently lives at the site.
- » Minimises the impact on heritage sites should they be uncovered.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, Camco Clean Energy (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. Camco Clean Energy (Pty) Ltd will retain various key roles and responsibilities during the construction of the facility.

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

6.1.1 Roles and Responsibilities for the Construction Phase

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

Site Manager (developers on-site Representative) will:

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

An independent² **Environmental Control Officer (ECO)** must be appointed by Camco Clean Energy (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 Basic Assessment Report.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the EMP.

²A person who is not from any of the parties involved in the design or construction of the Solar Energy System

- » 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.

Due to the nature and extent of the development, the Environmental Control Officer (ECO) should monitor site clearance activities (including search and rescue of protected plants), and should conduct monthly compliance inspections during the construction phase provided that compliance with the requirements of the Environmental Authorisation, EMP and environmental legislation is maintained.

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 PV system.
- » 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 appropriate Method Statements are drafted submitted to the Site Manager (and ECO) for approval before any work is undertaken.
- » 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 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 SHE 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.

OBJECTIVE 1: Minimise impacts related to inappropriate site establishment

The movement of workers on site needs to be well management in order to reduce the potential for environmental impacts.

| | |
|-------------------------------------|---|
| Project Component/s | » Area infrastructure (i.e. PV panels). |
| Potential Impact | » Loss of threatened plant species in areas outside of the development area. |
| Activities/Risk Sources | » Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site. |
| Mitigation: Target/Objective | » To secure the site against unauthorised entry. » To protect members of the public and Hotel. » 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. | Contractor and EPC | Site establishment, and duration of construction |
| Contractors and construction workers must be adequately informed of any no-go areas identified on the site and in the surrounding areas. | Contractor and EPC | Construction |
| Adequate measures must be implemented to prevent unauthorised access to the working area | Contractor and EPC | Site establishment, |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|-----------------------|--|
| and the internal access/haul routes. | | and duration of construction |
| Establish and maintain appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction). | Contractor and EPC | Site establishment |
| All unattended open excavations shall be adequately demarcated and/or fenced. | Contractor and EPC | Site establishment, and duration of construction |
| Establish and maintain 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 and EPC | Site establishment, and duration of construction |
| Ablution or sanitation facilities must not be located within 100 m from drainage lines. | Contractor and EPC | Site establishment, and duration of construction |
| Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling. | Contractor and EPC | 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 activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager. | Contractor and EPC | Site establishment, and duration of construction |

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

OBJECTIVE 2: Appropriate management of the construction site and construction workers

Ideally low skilled and semi-skilled positions will be filled by locals living in and around Johannesburg. This will however be dependent on the skills availability in the area.

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

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|-----------------------|--|
| The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified by the Basic Assessment studies. The location of this construction equipment camp/s shall be approved by the project manager. | Contractor | Pre-construction |
| As far as possible, minimise vegetation clearing and levelling for equipment storage areas. | Contractor and EPC | Site establishment, and during construction |
| Rehabilitate all disturbed areas at the construction equipment camp to pre-construction conditions as soon as construction is complete within an area. | Contractor and EPC | Duration of Contract |
| Ensure waste removal facilities are maintained and emptied on a regular basis. | Contractor and EPC | Site establishment, and duration of construction |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|--------------------------|
| Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept. | Contractor and EPC | Duration of construction |
| Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp. | Contractor and sub-contractor/s and EPC | Duration of contract |
| Cooking and eating of meals must take place in a designated area. No fires must be allowed on site. No firewood or kindling may be gathered from the site or surrounds. | Contractor and sub-contractor/s and EPC | Duration of contract |
| All litter must be deposited in a clearly marked, closed, weather and animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste. | Contractor and sub-contractor/s and EPC | Duration of contract |
| No one may disturb flora or fauna outside of the demarcated construction area/s. | Contractor and sub-contractor/s and EPC | Duration of contract |
| On completion of the construction phase, all construction workers must leave the site within one week of their contract ending. | Contractor and sub-contractor/s and EPC | Construction |
| Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law. | Contractor and EPC | Pre-construction |

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

OBJECTIVE 5: To avoid and or minimise the potential impacts of and dust and damage to roads caused by construction vehicles during the construction phase

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

| | |
|-------------------------------------|---|
| Project Component/s | » Construction and establishment activities associated with the establishment of the PV system, including infrastructure etc. |
| Potential Impact | » Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads. |
| Activities/Risk Sources | » The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads. |
| Mitigation: Target/Objective | » To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and minimise damage to roads. |

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

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|------------------------------|---|
| Performance Indicator | <ul style="list-style-type: none"> » Dust suppression measures implemented for all areas that require such measures during the construction phase. » 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 construction vehicles at outset of construction phase and up-dated on a monthly basis. |
| Monitoring | » Camco Clean Energy (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. |

OBJECTIVE 6: Minimisation of development footprint and disturbance to topsoil

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

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|-------------------------------------|--|
| Project Component/s | All constructional activities that disturb the soil below surface, such as levelling, excavations etc. |
| Potential Impact | <ul style="list-style-type: none"> » Lack of topsoil, resulting in significant decrease in soil fertility. » Impacts on natural vegetation |
| Activity/Risk Source | All constructional activities that disturb the soil below surface, such as levelling, excavations etc. |
| Mitigation: Target/Objective | Ensure effective topsoil covering on all disturbed areas. |

| 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 |
| If an activity will mechanically disturb below surface in any way, then the upper 10-30 cm of topsoil (depending on the specific topsoil depth at the site of disturbance) should first be stripped from the entire disturbed surface and stockpiled separately for re-use during rehabilitation. | Construction managers | Duration of the construction phase |
| Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. | Construction managers / Environmental manager | Duration of the construction phase |
| Dispose of all subsurface spoils from excavations where they will not impact on agricultural land (for example on road surfaces or within a waste disposal facility) or where they can be effectively covered with topsoil and rehabilitated. | Construction managers / Environmental manager | Duration of the construction phase |
| The stockpiled topsoil must be evenly spread over the entire disturbed surface. | Construction managers / Environmental manager | During rehabilitation after construction / operation. |
| Ensure that rehabilitation plan is followed so that bare areas are not exposed for prolonged periods with likely erosion impacts. | Contractor | Construction |
| Monitor the site for erosion problems and identify areas where additional intervention such as additional | Contractor | Construction |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|----------------|--------------|
| revegetation or erosion control such as silt traps may be necessary | | |
| Monitor disturbed areas for the presence and establishment of alien species , alien species present should be cleared on a regular basis | Contractor | Construction |

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|------------------------------|--|
| Performance Indicator | <ul style="list-style-type: none"> » That no disturbed areas are left without an effective covering of topsoil, and potential for re-vegetation, after rehabilitation. » Minimal disturbance outside of designated work areas. » Minimise clearing of existing vegetation. |
| Monitoring | <ul style="list-style-type: none"> » Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below. » Observation of vegetation clearing activities by ECO throughout construction phase. » An incident reporting system will be used to record non-conformances to the EMPr. |

OBJECTIVE 8: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

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

Management of erosion will be required during the construction phase of the facility. The section below provides a guideline for the management of erosion on site.

| | |
|----------------------------|--|
| Project Component/s | <ul style="list-style-type: none"> » PV arrays and foundations to support them. » Underground cabling. |
| Potential Impact | <ul style="list-style-type: none"> » Soil degradation including erosion, dust and siltation. |

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|-------------------------------------|--|
| | » Reduction in agricultural potential. |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Earthworks & activity on site. » Rainfall and concentrated discharge causing water erosion of disturbed areas. » Wind - erosion of disturbed areas. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » Minimise soil degradation (removal, excavation, mixing, wetting, compaction, pollution, etc.). » Minimise erosion. » Minimise sediment transport downstream (siltation). » Minimise dust pollution. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|-----------------------|---|
| Identify construction areas for general construction work and restrict construction activity to these areas. | Contractor | At design stage and during construction |
| Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling) | Contractor | During construction |
| Dust control on construction site through wetting or covering of cleared areas. | Contractor | Daily during construction |
| Minimise removal of vegetation which aids soil stability. | Contractor | Continuously during construction |
| Soil conservation - stockpile topsoil for re-use in rehabilitation phase. Protect stockpile from erosion. Topsoil should be stockpiled below 1 m height and for as short a period as possible to ensure survival of the soil seed bank and other soil-borne organisms. | Contractor | Continuously during construction |
| Erosion control measures- run-off control and attenuation on slopes (sand bags, logs), silt fences, storm-water channels and catch-pits, shade nets, soil binding, geofabrics, hydroseeding or mulching over cleared areas. | Contractor | Duration of contract |

| | |
|------------------------------|---|
| Performance Indicator | <ul style="list-style-type: none"> » Only authorised activity outside construction areas. » No activity in no-go areas. » Acceptable level of activity within construction areas. » Acceptable level of soil erosion around site. » Acceptable level of sedimentation along drainage lines. » Acceptable level of soil degradation. » Acceptable state of excavations. |
| Monitoring | <ul style="list-style-type: none"> » Monthly inspections of the site by the ECO. » Monthly inspections of sediment control devices by the ECO. » Immediate reporting of ineffective sediment control systems by |

| | |
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| | the SHE. |
| | » An incident reporting system will record non-conformances. |

OBJECTIVE 9: Minimising the impact on archaeological sites

During the survey for the proposed solar system, **no sites of heritage significance** were found in the development footprint.

| | |
|-------------------------------------|---|
| Project Component/s | » Solar Array » Construction equipment camps |
| Potential Impact | » Destruction of archaeological sites » Impacts on palaeontology |
| Activity/Risk Source | » Solar array foundations |
| Mitigation: Target/Objective | » Minimise impacts on archaeological and paleontological sites |

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

| | |
|------------------------------|---|
| Performance Indicator | » No destruction of archaeological or paleontological sites » No impacts on graves |
| Monitoring | » Monitoring during construction to ensure no sites are unearthed and impacted on |

OBJECTIVE 10: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the solar energy system will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage). The volumes of waste expected to be generated will not trigger the requirement for a waste

management license. Wastes must however be managed effectively in order to ensure minimal impacts on the environment.

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

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

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|-----------------------|----------------------|
| Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities. | Contractor | Duration of contract |
| Construction contractors must provide specific detailed waste management plans to deal with all waste streams. | Contractor | Duration of contract |
| Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control. | Contractor | Duration of contract |
| Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as | Contractor | Duration of contract |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|-----------------------|----------------------------|
| wood, metals, general refuse etc.). | | |
| Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors. | Contractor | Duration of contract |
| Uncontaminated waste must 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 must 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 must be used to ensure appropriate control of sewage. | Contractor | Duration of contract |
| Upon the completion of construction, the area must be cleared of potentially polluting materials. | Contractor | Completion of construction |
| Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site. | Contractor | Duration of construction |
| Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management. | Contractor | Duration of construction |
| An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. | Contractor | Duration of contract |
| Hazardous waste such as bitumen, oils, oily rags, paint tins etc. must be disposed of at an approved waste landfill site licensed to accept such waste. | Contractor | Duration of the contract |
| Hazardous substances must not be stored where there could be accidental leakage into surface or | Contractor | Duration of the contract |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|----------------|--------------------------|
| subterranean water. | | |
| Hazardous and flammable substances must be stored and used in compliance to the applicable regulations and safety instructions. Furthermore, no chemicals must be stored nor may any vehicle maintenance occur within 350m of the temporal zone of wetlands, a drainage line with or without an extensive floodplain or hillside wetlands. | Contractor | Duration of the contract |

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

6.3 Detailing Method Statements

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

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

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

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

Very specific areas to be addressed in method statements before, during and post construction include:

- » 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.
- » Flora protection process on and off site (i.e.: removal to reintroduction or replanting, if necessary).
- » 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.

Where relevant, these Method Statements must be prepared and submitted to Camco Clean Energy (Pty) Ltd Construction Manager, Project Manager and the ECO. The Contractor may not commence the activity covered by the Method

Statement until it has been approved by the Camco Clean energy (Pty) Ltd Construction Manager or Project Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

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

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 construction .
- » Employees must undergo training for the operation and maintenance activities associated with a solar energy system 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.

6.5 Monitoring Programme: Construction Phase

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

A monitoring programme must be in place not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring should be in line with relevant legislative requirements. 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 may be required by the relevant authority.

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

6.5.2 Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to GDARD 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 GDARD upon completion of the construction and rehabilitation activities. This report must be submitted to GDARD within 30-days after the completion of rehabilitation and must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

MANAGEMENT PROGRAMME: REHABILITATION

CHAPTER 7

Overall Goal: Undertake the rehabilitation measures in a way that ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

7.1. Objectives

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

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

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

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

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

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|---|--|
| Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion. | Contractor and EPC | Following completion of construction activities in an area |
| Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage lines as necessary. | Contractor in consultation with rehabilitation specialist | Post-rehabilitation |

| | |
|------------------------------|--|
| Performance Indicator | <ul style="list-style-type: none"> » All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants. |
| Monitoring | <ul style="list-style-type: none"> » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan. » On-going alien plant monitoring and removal should be undertaken on an annual basis. |

MANAGEMENT PROGRAMME: OPERATION

CHAPTER 8

Overall Goal: To ensure that the operation of the solar system 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 PV system in a way that:

- » Ensures that operation activities are appropriately managed in respect of environmental aspects and impacts.
- » Enables the solar energy system operation activities to be undertaken without significant disruption to other land uses in the area.
- » Minimises impacts on fauna using the site.

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

8.1. Objectives

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

OBJECTIVE 1: Limit the ecological footprint

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. » Areas disturbed during the construction phase and subsequent rehabilitation at its completion. |
| Potential Impact | <ul style="list-style-type: none"> » Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention. » Impact on the surrounding landscape due to alien plant invasion, erosion or poor management of the facility. |
| Activity/Risk | <ul style="list-style-type: none"> » Movement of employee vehicles within and around site. |

| | |
|---|---|
| Source | <ul style="list-style-type: none"> » Excessive shading by PV panels. » Altered rainfall interception and resultant runoff patterns by infrastructure. » Alien plants established within the facility » Erosion within the facility » Human presence » Maintenance activities which may lead to negative impacts such as dust pollution. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|--|--|
| Access to the site should be controlled, to the actual facility | Environmental manager | Operation |
| Vehicle movements must be restricted to designated roadways. | Camco Clean Energy (Pty) Ltd | Operation |
| No disturbance of vegetation outside of the project site must occur. | Camco Clean Energy (Pty) Ltd | Operation |
| A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis. | Camco Clean Energy (Pty) Ltd in consultation with Specialist | Annual monitoring until successful re-establishment of vegetation in an area |

| | |
|------------------------------|--|
| Performance Indicator | <ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts. » No disturbance of vegetation outside of project site. » No alien species within the site » No erosion problems within the site or from access roads » Maintenance of a ground cover of that resist erosion. |
| Monitoring | <ul style="list-style-type: none"> » Observation of vegetation on-site by facility manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas. » 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. |

OBJECTIVE 2: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

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

Management of erosion will be required during the operation phase of the facility. The section below provides a guideline for the management of erosion on site.

| | |
|-------------------------------------|--|
| Project Component/s | » PV panels. |
| Potential Impact | <ul style="list-style-type: none"> » Soil degradation. » Soil erosion. » Increased water run-off, soil degradation due to water erosion and sediment generation |
| Activities/Risk Sources | <ul style="list-style-type: none"> » Complete denudation of the soil » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. |
| Mitigation: Target/Objective | <ul style="list-style-type: none"> » Minimise soil degradation (removal, excavation, mixing, wetting, compaction, pollution, etc.). » Minimise erosion. » Minimise sediment transport downstream (siltation). » Minimise dust pollution. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|--|------------------------------|------------------|
| Maintain erosion control measures implemented during the construction phase. | Camco Clean Energy (Pty) Ltd | Operation |

| | |
|------------------------------|---|
| Performance Indicator | » No soil erosion around site |
| Monitoring | » Monitor erosion rates and erosion sites after each storm event. |

MANAGEMENT PROGRAMME: DECOMMISSIONING

CHAPTER 9

The solar infrastructure which will be utilised for the proposed solar energy system at Thaba Eco Hotel is expected to have a lifespan of 20-30 years (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

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

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 Rehabilitation

The site will be rehabilitated and can be returned to the current or other beneficial land-use. Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

FINALISATION OF THE EMPr

CHAPTER 10

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required.

**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.

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

Proposed generic grievance process

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

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

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

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

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

**APPENDIX B:
EROSION MANAGEMENT PLAN**

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion. The objective of the plan is to provide:

- A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and be accelerated by construction related activities.
- An outline of general methods to monitor, manage and rehabilitate erosion, ensuring that all erosion resulting from all phases of the development is addressed.

2. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the site should be to:

- » Protect the land surface from erosion;
- » Intercept and safely direct run-off water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
- » Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the site includes the following:

- » Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional summer thunder storms

can also cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.

- Soils loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation are therefore important elements of the erosion control strategy.
- » The extent of disturbance will influence the risk and consequences of erosion. Therefore site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared at one time, especially in areas where the risk of erosion is higher.
- » Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
- » Where necessary, new roads constructed should include water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.
- » Roads and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
- » All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
- » Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Gabions and other stabilisation features should be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
- » Activity at the site after large rainfall events when the soils are wet and erosion risk is increased should be reduced.
- » Topsoil should be removed and stored separately during construction activities, and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- » Regular monitoring of the site for erosion problems during construction (ongoing) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced.

2.1.1. Erosion control mechanisms

The contractor may use the following mechanisms to combat erosion when necessary:

- Reno mattresses
- Slope attenuation
- Hessian material
- Shade catch nets
- Gabion baskets
- Silt fences
- Storm water channels and catch pits
- Soil bindings
- Geofabrics
- Hydro-seeding and/or re-vegetating
- Mulching over cleared areas
- Boulders and size varied rocks
- Tilling

2.2. Engineering Specifications

A detailed Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers and this should include erosion control measures. Requirements for project design include:

- Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
- The location, area/extent (m²/ha) and specifications of all temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
- An onsite Engineer or Environmental Officer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- The Developer holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

2.3. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are

recorded as a result of the activities on site the Environmental Officer (during construction) or Environmental Manager (during operation) must:

- » Assess the significance of the situation.
- » Take photographs of the soil degradation.
- » Determine the cause of the soil erosion.
- » Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan.
- » Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
- » Report and monitor the progress of the rehabilitation weekly and record all the findings in a site register.
- » All actions with regards to the incidents must be reported on a monthly compliance report which will be submitted to the Competent Authority (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor/ Developer (in consultation with an appropriate specialist) must:

- » Select a system/mechanism to treat the erosion.
- » Design and implement the appropriate system/mechanism
- » Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapt or adjust to ensure the accelerated erosion is controlled.
- » Continue monitoring until the area has been stabilised.

3. CONCLUSION

The Erosion Management Plan is a document to assist the Developer with guidelines on how to manage erosion. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project.

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**GUIDELINES FOR INTEGRATED MANAGEMENT OF
CONSTRUCTION WASTE**

WASTE MANAGEMENT PLAN

PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management. This purpose of this plan is to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste that is generated from the activities on site. The plan prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste.

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and includes waste stream information available at the time of compilation. Construction practices and operations must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be further updated should further detail regarding waste quantities and categorisation become available, during the construction and/or operational stages.

RELEVANT ASPECTS OF THE SITE

Waste generated on site, originates from various sources including:

- » Concrete waste generated from removal and demolition of the batching plant, dummy columns, plinths, temporary bunds and foundations, spoilt and excess concrete.
- » Contaminated water, soil and vegetation due to hydrocarbon spills.
- » Hydrocarbon waste from vehicle, equipment and machinery parts (oil cans, filters, rags, etc.), and servicing.
- » Hazardous/ non-hazardous chemical waste from, chemical dosing in the WTP/WWTP, cleaning of steam/ heat storage vessels and pipework, fluorescent tubes and waste ink cartridges.
- » Recyclable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE), Cardboard and rockwool. Organic waste from food waste and alien vegetation removal.
- » Sewage from portable toilets and septic tanks.
- » Inert waste from excess rock and soil from site clearance and trenching works.

LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by means of a number of pieces of legislation, including:

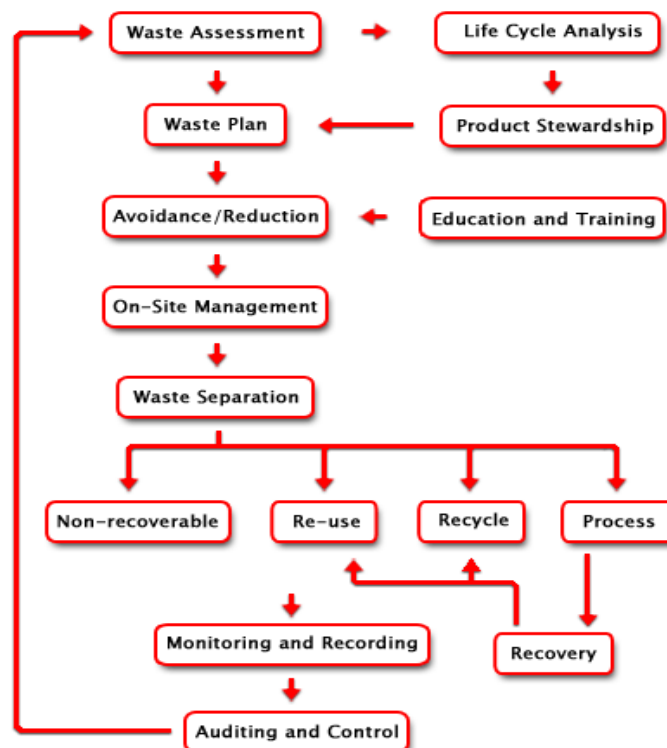
- » National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008)
- » National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)
- » The South African Constitution (Act 108 of 1996)
- » Hazardous Substances Act (Act 5 of 1973)
- » Health Act (Act 63 of 1977)
- » Environment Conservation Act (Act 73 of 1989)
- » Occupational Health and Safety Act (Act 85 of 1993)
- » National Water Act (Act 36 of 1998)
- » The National Environmental Management Act (Act 107 of 1998)
- » Municipal Structures Act (Act 117 of 1998)
- » Municipal Systems Act (Act 32 of 2000)
- » Mineral and Petroleum Resources Development Act (Act 28 of 2002)
- » Air Quality Act (Act 39 of 2004)

Storage of waste must be undertaken in accordance with the National Norms and Standards for the Storage of Waste published in GN926.

WASTE MANAGEMENT PRINCIPLES

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

The Integrated Waste Management Approach to Waste



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

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

- » Reducing volumes of waste is a priority;
- » If reduction is not feasible, the maximum amount of waste is to be recycled; and
- » Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner as possible.

Construction phase

A plan for the management of waste during construction waste is detailed below. As previously stated, construction practices must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction.

Waste Assessment / Inventory

- » The Environmental Officer must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- » Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
- » Once a waste inventory has been established, targets for recovery of waste (minimisation, re-use, recycling) should be set.
- » The Environmental Officer must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

Waste collection, handling and storage

- » Each subcontractor must implement their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc.
- » Waste collection bins and hazardous waste containers must be provided by the principal contractor and placed at various areas around site for the storage of organic, recyclable and hazardous waste.
- » A dedicated waste area must be established on site for the storage of all waste streams, before removal from site.
- » Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).

- » Hazardous waste must be stored within a bunded area constructed according to SABS requirements. The volume of waste stored in the bunds must not exceed 110% of the bund capacity.
- » The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.
- » Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- » A dedicated waste management team must be appointed by the principal contractors' EO, whom will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the EO.
- » All waste removed from site must be done so by a registered/ licensed subcontractor, whom must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month.

Management of waste storage areas

- » The position of all waste storage areas must be located away from water courses and ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and dirty storm water.
- » Collection bins placed around site and at subcontractors' camps must be maintained and emptied on a regular basis by the principal contractor.
- » Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked or colour coded and well-maintained, not allowing access to vermin or other rodents. Shade cloth should ideally be used to ensure avifauna does not have access to waste.
- » Waste must be stored in designated containers and not on the ground.
- » Inspections and maintenance of bunds must be undertaken daily. Bunds must be inspected for leaks or cracks in the foundation and walls.
- » It is assumed that any rainwater collected inside the bund is contaminated and must be removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

Disposal

- » Waste generated on site must be removed on a regular basis, as determined by the Environmental Officer. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.