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ENVIRONMENTAL MANAGEMENT PROGRAM

Photovoltaic Solar Plant near Augrabies

Farm Portion 9 of the Farm Rooipad no 15, Augrabies, Kai! Garieb Municipality, Northern Cape Province

10 DECEMBER 2013

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Rosenthal Environmental

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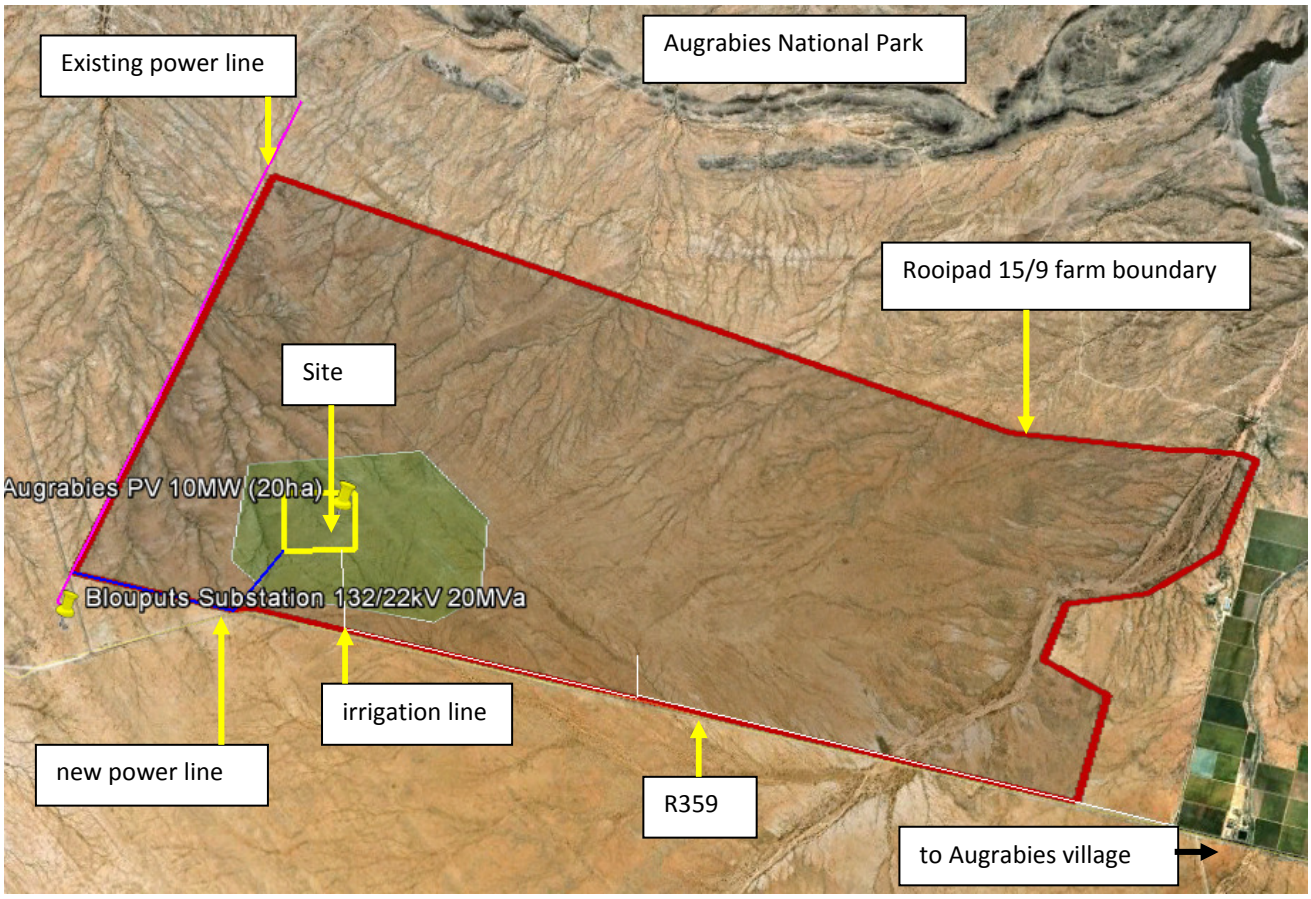
1. INTRODUCTION

1.1. BACKGROUND

Ecosense has been appointed by Rosenthal Environmental on behalf of Mulilo Renewable Energy (Pty) Ltd, the developers of the proposed Photovoltaic Solar Plant near Augrabies in the Northern Cape, to compile an Environmental Management Program (EMPr) dealing with principally the construction phase as well as the long-term environmental management of the development. The project site is located on an area of just under 20 hectares (ha) on Portion 9 of the Farm Rooipad no 15. The site is situated close to the Blouputs electrical substation, approximately 2 kilometres south of the Augrabies Falls National Park and north of the R359 tar road running East-west (see **Figure 1 Site Locality and Aerial View Plan**). The current land use is predominantly agriculture in the form of extensive grazing of sheep and cattle which will continue on the remainder of the farm. The site falls within the jurisdiction of the Kai! Garieb Municipality.

Figure 1: Site Location Plan and Aerial View



The 10 MW Solar Energy Facility will be a Photovoltaic (PV) power plant which will feed electricity directly into the national grid at the Blouputs substation and be used by those living in the Kakamas and Augrabies area.

The primary infrastructure will consist of an array of black PV solar modules which are grouped into larger fixed panels which are then mounted on steel frames to a height of 2.5 to 3 meters and located in a total footprint area of less than 20 hectares. These may be either be of a fixed or single axis tracking type. Associated infrastructure includes:

- a new 22kv transmission line (wooden pole up to 8.5 m high with three transmission wires) to connect to the existing 22 kv line running across the westerly portion of the farm to the Blouputs substation;
- inverter sub-station and connection centre;
- underground cabling between panels;
- site access road from the R359, ±6 m wide and 400 meters long, gravel with concrete/reno-mattress causeways;
- access roads within the facility, ±4 m wide, gravel with concrete causeways;
- 1 x control centre/ maintenance building;
- security perimeter fencing
- a construction lay down area
- water storage tanks
- small water supply pipeline of at approximately 6.5 km

(**See Site Layout Plan – Appendix 1**).

This document serves to meet the requirements of the Department of Environmental Affairs (DEA), who require an EMPr that indicates environmental mitigation for the development as part of the Environmental Impact Assessment process.

This document deals with design, construction, operational and decommissioning phase aspects of the development and its associated natural environment, which will require management to maintain or improve the quality of the natural and man-made environment, as well as activities on site, which may have potentially negative impacts on the surrounding environment. While providing guidelines as to how these aspects should be managed, this document should be seen as open-ended, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment.

1.2. THE AFFECTED ENVIRONMENT AND ANTICIPATED ENVIRONMENTAL IMPACTS

1.2.1. Topography, drainage and soils

The proposed site is generally flat to gently undulating but the surrounding area has several low rocky ridges running from north west to south east.

While no permanent water bodies or drainage lines exist on the site, small non-perennial drainage lines and small ephemeral pans exist on the site. Significant drainage lines and ephemeral pans are considered to have high ecological sensitivity and are susceptible to erosion if disturbed and thus their location has been considered/avoided when placing the solar panel footings and electricity line pylons in the proposed design of the facility.

Careful design and construction methods must be employed at points where roads, the water line or cables need to cross drainage lines to reduce the impact of such crossings. These issues are addressed by the Design phase EMP, section 3.2.2.2.

The site comprises shallow to very shallow, red and red-brown sandy or sandy loam top soils, often calcareous, with rock in the west. The surface is littered with small rocks and quartz pebbles. These shallow soils, in addition to the very low rainfall, make the area unsuitable for crop cultivation (*D.G Paterson, February 2012*). This fact also means that re-vegetation of the site after construction disturbance is difficult and as such the disturbance of the soil crust and existing vegetation cover should be limited as far as is possible. This is covered in section 4.13.2 (Site Clearance and Earthworks) of the Construction phase Environmental Management Plan (CEMP). In addition, the sandy soils are also prone to wind erosion, particularly if the soil crust is disturbed. This could not only result in loss of valuable topsoil but also could cause problems for the facility itself by resulting in dust on the panels thus reducing their efficiency and increasing panel cleaning requirements and related water consumption. This thus again requires the need to limit the disturbance of the soil crust and its stabilising vegetation during construction of the facility and further measures may need to be employed during the construction and operational phases to stabilise disturbed soils to prevent such erosion. This is covered in section 4.13.9 (Dust Control) and 4.13.12 (Vegetation Management Requirements) of the CEMP and section 5.9.2 (Dust Control) and section 5.9.6 (Management of Vegetation Rehabilitation Areas) of the Operational phase Environmental Management Plan (OEMP).

1.2.2. Flora *(Information extracted from the Botanical Report, Feb 2012 (updated Dec 2013) by Dr D J McDonald)*

The site falls within the Nama-Karoo Biome Nama Karoo Biome, Bushmanland and West Griqualand Bioregion (Rutherford & Westfall, 1994; Mucina et al., 2006) with one vegetation type occurring on the site itself, namely Blouputs Karroid Thornveld. This vegetation type is rated as Least Threatened as there has been low transformation by agriculture and infrastructure developments.
The site does not fall within a proclaimed threatened ecosystem and no threatened species (Red List) species have been recorded for the area.

The vegetation is generally in moderate to good condition but there are signs in some areas of overgrazing. Species recorded away from the seasonal drainage lines include: *Acacia mellifera* subsp. *detinens* (blackthorn), *Aloe claviflora* (Kraal aloe), *Aptosimum marlothii* (Koffiepit), *Asparagus cooperi, Boscia foetida* subsp. *foetida, Enneapogon scaber* (Rock Nine-awned Grass), *Eriocephalus aspalathoides, Eriocephalus* cf. *microphyllus* var. *pubescens, Euphorbia gregaria, Hermannia modesta*, *Indigofera pechuelii, Leucosphaera bainesii*, perdebossie, silwerbossie), *Lycium bosciifolium* (Slapkriedoring), *Microloma incanum, Monechma genistifolium* subsp. *austral, Monechma* sp. (white flower), *Monsonia* (*Sarcocaulon*) *crassicaule* (Bushman Candle), *Parkinsonia africana* (Wild green-hair tree), *Rhigozum trichotomum* (three thorn), *Sarcostemma viminale, Stipagrostis ciliata* (Tall Bushman Grass), *Stipagrostis obtusa* (Small Bushman Grass) and *Zygophyllum rigidum.*

The species composition of the drainage-line vegetation is similar to that found away from the drainage-lines. Notable exceptions are the presence of *Hibiscus elliottiae*, *Montinia caryophyllaceae* (abundant), *Cenchrus ciliaris* (Foxtail Buffalo Grass) and the tree *Ehretia rigida*. *Aptosimum marlothii* and *Indigofera pechuelii* are also more abundant along the edges of the drainage lines and some species are taller and the vegetation denser. Owing to the concentration of plant species and the habitat associated with the seasonal drainage lines, these areas are considered more botanically sensitive than the areas away from the drainage lines on the relatively flat, open plains. Therefore, the seasonal drainage lines should be avoided or impacted as little as possible by the proposed PV facility. This addressed in the design phase EMP section 3.2.2.1.

The development of the facility will result in the loss of numerous shrubs and trees, notably old specimens of both *Boscia foetida subsp. foetida* and *Boscia albitrunca* (Shepherd's Tree) which would be unavoidable. It would not be possible to transplant these trees. There are also numerous patches (colonies) of *Aloe claviflora* (refer to **Figure 2**). These plants can be however be relatively easily relocated. A 'search and rescue' operation will thus be undertaken prior to construction during which *Aloe claviflora* plants are collected and relocated to other areas of similar habitat on Rooipad 15/9 that would be unaffected by construction. This will be undertaken per CEMP section 4.13.2 (Site Clearance and Earthworks). It is noted that protected tree and plant species, including the *Aloe* and *Boscia* sp mentioned above, cannot be destroyed or transplanted without the applicable permits, which be sought prior to construction commencing in each area.

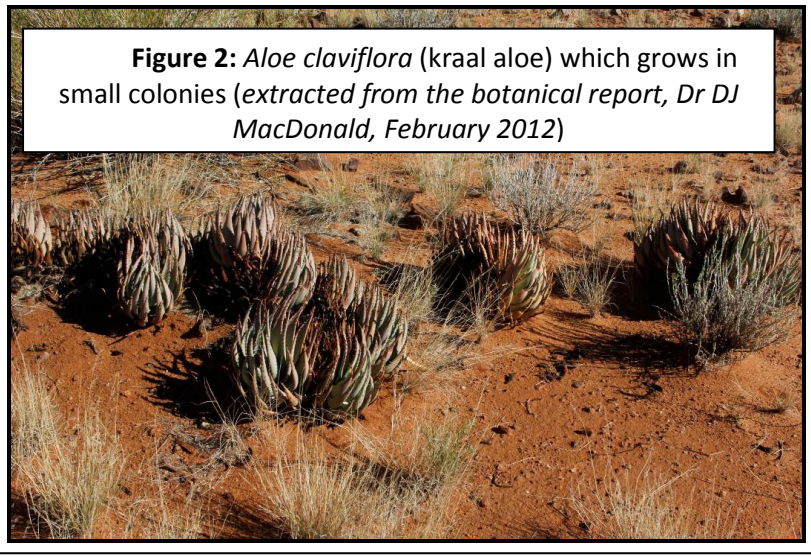


Figure 2: *Aloe claviflora* (kraal aloe) which grows in small colonies (*extracted from the botanical report, Dr DJ MacDonald, February 2012*)

An effort must be made to retain as much of the vegetation on site as possible as opposed to blanket clearing the facility footprint. Refer to the design EMP section 3.2.2.6 and the CEMP section 4.13.2 (Site Clearance and Earthworks).

1.2.3. Fauna

(Information extracted from the Ecology Impact Assessment Report, February 2012 by Dr David Hoare)

The following mammal and bird species of conservation concern have a geographical distribution that includes the site and they could potentially occur on site or nearby:
[NT = near threatened; VU = vulnerable, EN = endangered, LC = least concern]

1. Littledale's Whistling Rat (NT),
2. Dassie Rat (NT),
3. Ludwig's Bustard (VU/EN),
4. Kori Bustard (VU/LC),
5. Sclater's Lark (NT),
6. Martial Eagle (VU),
7. Secretarybird (NT),
8. Lanner Falcon (NT).

However, some of these are unlikely to be affected by activities on site or there is no suitable habitat on site. Only the following species are considered to be vulnerable to individual mortality due to activities on site or loss of habitat by development of the site:

1. Littledale's Whistling Rat (NT),
2. Dassie Rat (NT),
3. Ludwig's Bustard (VU/EN),
4. Kori Bustard (VU/LC),
5. Sclater's Lark (NT).

No reptiles of conservation concern are recorded for the site and the Giant Bullfrog is the only amphibian species of conservation concern (protected under the National Environmental Management: Biodiversity Act) with a distribution that includes the study area. The site is however not considered to contain habitat suitable for this species and it is considered unlikely to occur there.

Negative impacts on any animal on site through the project development could occur through direct mortality (e.g. bird collisions with power lines or a tortoise being damaged by a vehicle) or through impacts on the habitats of the animals, including drainage lines/pans on site which represent particularly vital natural corridors. The principal activities related to the proposed solar energy facility that could pose direct risks to animals and their habitat, are listed as follows:

Design phase:

- Location of permanent infrastructure - placement of buildings, power lines, cables and water pipelines (if applicable).

The design phase EMP addresses the above identified potential impacts in section 3.2.2.1.

Construction phase:

- Location and operation of construction camps/temporary infrastructure.
- Clearing of land for construction.
- Construction of access roads.
- Storage of materials required for construction.
- Establishment of borrow and spoil areas.
- Chemical contamination of the soil by construction vehicles and machinery.
- Direct impact on animals on site.

The CEMP provides mitigation measures for the above identified potential impacts in the following sections:

- CEMP section 4.13.1 (Site Establishment) - location of temporary site facilities;
- CEMP section 4.13.2 (Site Clearance and Earthworks) - minimising vegetation clearance;
- CEMP section 4.13.4 (Restriction of Working Areas) to ensure that construction impacts are contained within the footprint of the proposed infrastructure and do not spread into surrounding natural areas.
- CEMP section 4.13.10 (Materials Handling and Storage) - to limit footprint damage in sensitive environments, manage spoil areas;
- CEMP section 4.13.3 (Fuel/flammables Storage and Handling), section 4.13.5 (Housekeeping and Waste Management), section 4.13.6 (Concrete and Cement Works) and section 4.13.11 (Hazardous Material Storage and Handling) - prevention of pollution on site;
- CEMP section 4.13.13 (Animals on Site) - rescue and relocation of animals on site that do not/cannot move off site on their own e.g. a snake trapped in a trench, a slow moving tortoise etc.

Operational phase:

- Maintenance of surrounding vegetation as part of management of the facility.
- Bird impacts with overhead infrastructure, particularly power lines.

The OEMP provides mitigation measures for the above identified potential impacts in the following sections:

- OEMP section 5.9.6 (Management of Vegetation Rehabilitation Areas) - maintaining re-establishment of vegetation cover and sensitive trimming of vegetation near the panels;
- OEMP section 5.9.8 (Animals on Site) - installation of devices to minimise bird collisions.

1.2.4. Heritage Resources

Palaeontology

(Information extracted from the Paleontological Assessment Report, February 2012, John E. Almond)

The potential for impact on paleontological resources by the facility is seen as very low as the bed rocks in the area do not contain fossils and the geologically recent, superficial sediments are considered sparsely fossiliferous or unfossiliferous. Despite this, should any significant fossil remains in fact be uncovered during the construction phase, these will be dealt with per section 4.13.4 of the CEMP.

Archaeology

(Information extracted from the Heritage Assessment Report, Feb 2012, Jayson Orton)

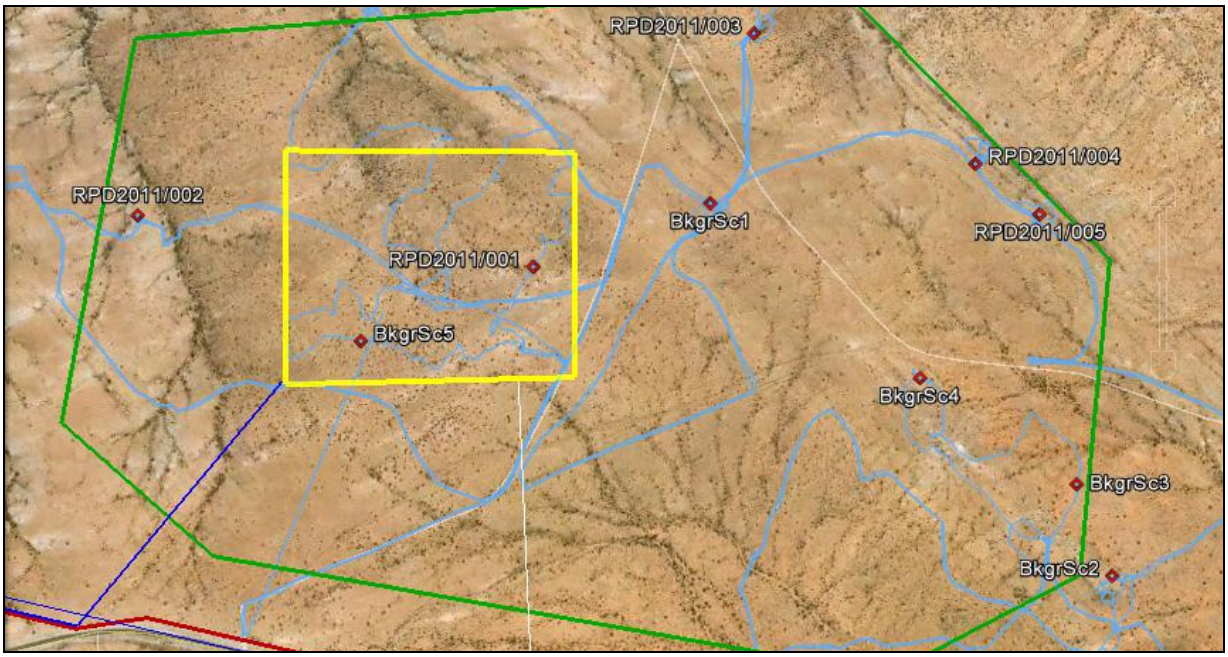
The heritage specialist study found that the proposed development footprint will have negligible impacts on archaeological resources.

Table 1 below summarizes the heritage resources that were recorded on and adjacent to the site. Note that only 1 resource (RPD2011/001 - a Stone Age scatter with low significance) is located within the development footprint.

Table 1: Summary list of all heritage occurrences found on Rooipad 15/9 near to the site

Number	Location	Description	Heritage significance
RPD2011/001	S28° 36’ 20.5” E20° 14’ 05.6”	LSA artefact scatter	Low
RPD2011/002	S28° 36’ 17.6” E20° 13’ 40.7”	Stone cairn / grave	(potentially) Very high
RPD2011/003	S28° 36’ 07.5” E20° 14’ 19.5”	LSA artefact scatter	Low-Medium
RPD2011/004	S28° 36’ 14.8” E20° 14’ 33.4”	LSA artefact scatter	Low-Medium
RPD2011/005	S28° 36’ 17.6” E20° 14’ 37.4”	LSA artefact scatter	Low-Medium

Figure 3: Aerial view of the site (yellow box) showing the locations (red diamonds) of recorded heritage resources (*extracted from the heritage report, Orton, February 2012*) Light blue lines shows specialist walking tracks



NOTE: "BkgrSc" in Figure 3 indicates recorded occurrences of background artefact scatter which have negligible heritage value.

The most significant find near to the site is a stone cairn (RPD2011/002 in the table and figure above and per the photograph on the following page) that may well represent a Khoekhoe grave similar to a host of others documented in the general area. While it cannot be confirmed without excavation that it is a grave, it must be treated as of very high significance and protected from any disturbance. This is addressed in CEMP in section 4.13.4.

Should anything of heritage significance be discovered during the development of the site not previously recorded or visible, this will be dealt with according to the relevant management requirements set out by this CEMP in section 4.13.4.

Figure 4: The large stone cairn / pile at RPD2011/002 (*extracted from the heritage report, Orton, February 2012*)

Note that stone cairns, rocky ridges and prominent outcrops are not impacted by the development design considered by this EMPr. Should the design change and this no longer be the case, strong motivation for the destruction of known heritage resources must be provided to the South African Heritage Resources Agency (SAHRA) and a Phase 2 mitigation excavation may be required.

1.2.5. Structures and Infrastructure on Site (pre-development)

No structures exist on the development site itself. A stone cairn is located off site to the north west is described in section 1.2.5 above.

1.2.6. Surrounding land uses

The site is surrounded to the south and east by agricultural land, currently used predominantly for sheep grazing and, further afield where irrigation is available, for grape production.

The Augrabies National Park is located to the North and west of the site.

1.2.7. Visual Impact

(Information extracted from the Visual Impact Assessment Report, Albert van der Stok, February 2012,)

While the sense of place in the area will be affected by the inclusion of an 'industrial' element in the overall visual environment where at present there is no precedent, it is believed that this change is within acceptable limits. The limited height of the facility together with its topography hugging nature limits its visual exposure. Potential visual impact along sight lines viewed from the Augrabies National Park will be re-checked once construction has been completed and if required may be further mitigated per the Design EMP section 3.2.2.12. The rural setting in which the facility is located is characterised by dark night skies and indiscriminate use of lighting could significantly increase the visual impact of the facility. This is addressed in the Design phase EMP section 3.2.2.12, CEMP section 4.13.14 (Noise, Nuisance and Lighting Control) and OEMP section 5.9.10 (Noise and Lighting Control).

The construction phase will have temporary visual impacts associated with it which can be mitigated by restricting the disturbance footprint (section 4.13.4 of the CEMP), litter control (section 4.13.5 of the CEMP), prevention of introduction of alien plant species to site (section 4.13.10 of the CEMP), veld fire prevention (section 4.13.15 of the CEMP) and rehabilitation and cleanup after construction has been completed (section 4.13.19 of the CEMP). Similarly during the operational phase the OEMP addresses litter/waste control (section 5.9.9), fire prevention (section 5.9.11) and vegetation management (section 5.9.6) to mitigate possible negative visual impacts.

Visual impacts can be reversed with decommissioning and is addressed by the decommissioning phase requirements set out in section 6 of this EMPr.

1.2.8. Social

The use of local skills, labour, products and services wherever possible and practical is always encouraged to encourage buy-in from the surrounding community, boost the local economy and reduce the carbon footprint of the development. This is addressed in Sections 4.9 of the CEMP and 5.4 of the OEMP respectively.

1.3. BACKGROUND TO THE ENVIRONMENTAL MANAGEMENT PROGRAM (EMPr)

Ecosense, whose principal member is registered with SACNASP and who have extensive experience in the compilation of EMPs, was appointed to compile the EMPr for this Solar Energy Facility, for the approval of the Department of Environmental Affairs (DEA) as part of the Basic Assessment Report submission.

An EMPr is a legal requirement in terms of Section 24N of the National Environmental Amendment Act, 2008. It describes environmental management measures and mitigation to limit environmental impacts. This is to include specifications for planning / design, construction, operational and decommissioning phases of each project. These requirements form the basis of the scope covered by this EMPr. The Construction phase Environmental Management Plan (CEMP) and the Operational Phase Environmental Management Plan (OEMP) have been written as separate sections that can be removed as stand-alone documents where required e.g. to be incorporated into contractors' contract documentation (as in the case of the CEMP) or in the Operator's information pack (in the case of the OEMP).

The EMPr is intended for use by (as applicable) the developer, project management, the principal agents and contractors during construction, the operator and its management staff during the operational phase, DEA, and where required, the Local Authority (Kai! Garieb Municipality).

1.4. OBJECTIVES OF THE EMPr

The EMPr aims to achieve the following objectives:

- To provide a structure or framework within which the environmental management requirements will be implemented, audited and reported on, in order to ensure that potential impacts on the environment are minimised.
- To set out the mitigation measures and environmental specifications which are required to be implemented during the various phases of the development in order to minimise the extent of environmental impacts, to manage environmental impacts and where possible to improve the condition of the environment.
- To state standards and guidelines that are required to be achieved in terms of environmental legislation and authorization conditions.
- To provide a clear indication of the environmental management requirements of each of the role players involved.

1.5. FORMAT AND STRUCTURE OF THE EMPr

This EMPr has been divided into a number of Sections, as indicated in Table 2 below.

Table 2: Structure of the EMPr

Section 1	**Introduction**	Provides background information regarding the site, the proposed development and the EMPr.
Section 2	**Implementation of the EMPr**	Provides details regarding implementation of the EMPr.
Section 3	**Design Phase Requirements**	Provides environmental requirements to be considered for the design phase of the project.
Section 4	**Construction Phase Management Requirements (CEMP)**	Provides environmental management procedures to be implemented during the construction phase of the development. This is incorporated into a Construction Phase Environmental Management Plan (CEMP) which can be used as a stand-alone document to be incorporated into construction contract documentation.
Section 5	**Operational Phase Management Requirements (OEMP)**	Provides environmental management procedures to be implemented during the operational phase of the development. This is incorporated into an Operational Phase Environmental Management Plan (OEMP) which can be used as a stand-alone document to be incorporated into the operator's site management documentation.
Section 6	**Decommissioning phase requirements**	Provides environmental requirements to be considered for the decommissioning phase aspects of the project.

Section 7	**References**	References other professional's documents and resources used to source information background to this EMPr.
Section 8	**Appendices**	Appendices general to the EMPr (excluding Appendices specific to the CEMP and OEMP documents)

1.6. INTERPRETATIONS

For the purposes of this EMPr the following general abbreviations and definitions shall apply:

EA	Environmental Authorisation – issued by DEA
CEMP	Construction Phase Environmental Management Plan
DAFF	Department of Agriculture, Forestry and Fisheries
DEMP	Decommissioning Environmental Management Plan
DEA	Department of Environmental Affairs
OEMP	Operational Phase Environmental Management Plan
SAHRA	South African Heritage Resources Agency

Developer	Developer of the project infrastructure, Mulilo Renewable Energy (Pty) Ltd.
Environment	The aggregate of surrounding objects, conditions and influences that influence the life and habits of man or any other organism or collection of organisms.
Environmental Management Plan	Environmental management plans forming part of the overarching Environmental Management Program (EMPr), namely the Construction phase Environmental Management plan (CEMP), the Operational Phase Environmental Management Plan (OEMP) and the Decommissioning Environmental Management Plan (DEMP).
Local Authority	Refers to the Kai! Garieb Municipality.
Structure	Means any man-made feature affixed to the ground or attached to something located on the ground, including but not limited to fences, walls, berms, levees, fill, storage tanks, shelters or buildings.

Note: Some of these interpretations will be repeated in the individual environmental management plans that follow to allow these to act as stand-alone documents.

2. IMPLEMENTATION OF THE ENVIRONMENTAL MANAGEMENT PROGRAM

This EMPr document describes mitigation measures in detail, identifying specific people or organisations to undertake specific tasks, in order to ensure that impacts on the environment are minimised during the various phases of the development.

As the organisational structure and role players are different for each of the four principal phases of the project, this will be detailed under the respective sections/management plans (sections 3,4,5 and 6) of this EMPr dealing with each of these.

2.1. LEGAL STATUS

By virtue of the fact that this document describes mitigation measures that influence the outcome of the environmental authorisation process for this project and its implementation will be a requirement of the Environmental Authorisation issued by the national Department of Environmental Affairs (DEA), there exists a legal obligation for the specifications of this EMPr to be complied with. This EMPr includes all relevant documentation contained or referred to within it, along with any amendments or appendices to this document.

2.2. KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT

The following is a list of key laws that are applicable to the development. All relevant approvals and permits, or any other management requirements in terms of this, or any other legislation applicable to the development, as well as any future amendments to such legislation, are to be complied with. It should be noted that this is not a comprehensive list of all legislation that may apply, only those deemed most relevant to this context.

TABLE 3: Applicable Environmental Legislation

ACT, ORDINANCE, BY-LAW	SECTION	DESCRIPTION	RELEVANCE TO THIS PROJECT
National Environmental Management Act (No 107 of 1998) as amended	24 and 24D	List of activities requiring authorisation before commencing	Environmental approvals and conditions are made in terms of this act. (refer to Environmental Authorisation) If any additional activities listed are planned then permission to commence needs to be applied for.
	S 28(1)	Duty of care responsibilities	Responsible for the duty of care of natural assets
National Environmental Management: Waste Act (No 59 of 2008)	Chapter 4 Pt 3 and 5	Regulates waste management in order to protect health and the environment.	Calls for reduction, re-use, recycling and recovery of waste, sets out requirements for storage, collection and transportation of waste
National Water Act (No 36 of 1998)	S 19	Pollution prevention	Prevent pollution of water sources e.g. via stormwater
	S 21 /22	Definition of Water Uses in terms of the Act and sets out permissible water uses and licensing requirements	Altering the bed, banks, course or characteristics of a water course (such as the drainage lines on site) constitutes a Water Use requiring licensing.
	G.A. 3.7	Discharging of domestic and industrial wastewater into water resources	Sets water quality limits for waste water that may be directed into a water resource e.g. via stormwater.

ACT, ORDINANCE, BY-LAW	SECTION	DESCRIPTION	RELEVANCE TO THIS PROJECT
Conservation of Agricultural Resources Act (No 43 of 1983)	Reg 15	Declaration of weeds and invader plants	Listed invader plants
	Reg 15	Combating invader plants	No alien invasive vegetation allowed to establish on site.
Environment Conservation Act (No 73 of 1989)	Reg	Noise regulations	Legislation that governs noise limits
Occupational Health and Safety Act (No 85 of 1993)	All	Primarily aimed at ensuring the health and safety of persons at work and visitors. Specifies the basic systems that need to be in place and measures that need to be taken.	The staff and visitors to site need to be protected from health and safety risks.
	S 9(1)	Every employer must conduct his undertaking so as to ensure that persons other than his employees who may be directly affected by his activities are not thereby exposed to hazards to their health and safety.	The development must minimise the hazards to both staff working on the site and visitors.
Hazardous Chemical Substances regulations (25 August 1995)	9A(1)	Storage and handling of hazardous chemical substances	Need to ensure the safety of staff working with hazardous chemicals (as well as safe storage, use and disposal of containers.
National Environment Management: Air Quality Act (No. 39 of 2004)	S 27, 32, 34, 35,	Prevention of air pollution (dust, smoke, noise and offensive odours)	The necessary steps to be taken in prevention of air pollution on site.
Veld and Forest Fire Act (Act No 101 of 1998)	S 12(1)	Duty of land owner to prevent fire from spreading to neighbouring properties	Cautionary steps in avoiding the spread of fire to and from neighbouring properties.
National Heritage Resources (Act No. 25 of 1999)	S 44(1)	Preservation and protection of Heritage resources	Protection of heritage resources that may be found on site.
Northern Cape Nature Conservation Act (2009)	S 3	Restricted activities involving specially protected animals	No trapping, hunting of animals on site without a permit
	S 50/51	Restricted activities involving protected/indigenous plants	No picking of indigenous plant material (outside of development footprint) by construction/operations staff
	S 55 (2)	Owner of land on which invasive alien plant species are found bust take necessary steps to eradicate such species.	Developer/Operator to clear any invasive alien plant species that may establish on the development property

2.3. FINANCING OF ENVIRONMENTAL CONTROL

Financing of environmental control requirements outlined in this document, as they relate to each of the development phases of the project, is the responsibility of the Developer and Operator respectively unless where another party has been identified as the responsible party. Details are provided under the respective environmental management plans comprising this EMPr.

2.4. REVIEW OF THE EMPr

The environmental management plans (CEMP and OEMP) contained in this EMPr are to be reviewed on a regular basis as detailed in each of those plans.

2.5. MONITORING AND AUDITING

The implementation of the environmental management plans (CEMP and OEMP) contained in this EMPr must be monitored and externally audited as detailed in each of those plans, to ensure that the management specifications are correctly implemented and that there is proper record keeping and reporting to support this.

3. PLANNING AND DESIGN PHASE REQUIREMENTS

This module describes planning and design phase principles applied to mitigate the environmental impacts of the project.

3.1. PLANNING PHASE

Adequate planning is crucial to the success of the project as a whole. As part of the planning phase the following have been considered by the project planning team during the environmental impact assessment/feasibility study stage:

- Topography
- Geology and soils
- Climate
- Hydrology
- Natural ecosystems (flora and fauna)
- Social and economic regional and local context
- Cultural and historical landscapes and archaeological and paleontological sites
- Land use planning requirements
- Planning and environmental approval requirements and specialist studies required
- Economic viability
- Development requirements e.g. services
- Ownership opportunities and constraints
- Site/spatial opportunities and constraints
- Surrounding land uses
- Maintenance capacity

The planning opportunities and constraints considered above have informed the preferred project site locality and preferred layout plan options on which this EMPr is based.

3.2. DESIGN PHASE

Two levels of design detail are considered. Broad level design informs the Environmental Impact Assessment Report submission and more detailed design of the project elements will take place if and when the project is authorised.

3.2.1. Recommended design team:

Engineer: An engineer skilled in the design of infrastructure systems should determine infrastructure requirements and design appropriate systems.

Environmental Consultant: The environmental consultant should alert the Developer at the conceptual stage of the development to crucial aspects/impacts of the environment, which are fulfilling an important role and should be taken into consideration and mitigated where there could be adverse impacts, as well as opportunities for enhancement or rehabilitation of existing natural features.

Specialist consultants: E.g. botanist, heritage consultant etc.

3.2.2. Design process and outcome:

Design considerations as they relate to environmental impact and motivation for the preferred design location and option for this development have been considered as part of the environmental impact assessment process. Some aspects for design are to be considered at the detailed design stage, however, and are described below. These include design recommendations made by various specialists appointed to the project:

3.2.2.1. Siting of infrastructure

- The drainage lines on site are ecologically sensitive in terms of the habitats they provide and are vulnerable to disturbance. Infrastructure has been located on site to take these into account and any detail design changes considered shall also take this into account.
- Existing road/track footprints on site must be used as service roads where possible.

3.2.2.2. Drainage lines

- Should the water pipeline need to cross a seasonal drainage line, it must be buried at the crossing so as not to impede water flow. In addition, if the pipeline is to be buried, the smallest possible trench should be made and the surface soil not be compacted after replacement to allow vegetation to re-establish. (*MacDonald, 2012*).
- A similar approach must be taken for any cables crossing drainage lines and these must be placed in ducts at crossings to avoid disturbance should they need to be removed/repaired.
- Any construction within 32 meters of a drainage line requires authorization from the Department of Water Affairs, which must be sought in advance of the construction phase.

3.2.2.3. Road surfacing:

- Roads should not to be concreted throughout except for where concreted causeways need to be constructed where roads cross seasonal drainage lines as this can significantly impact the hydrology of the site and consequently the vegetation on site (*MacDonald, 2012*). Reno-mattresses filled with gabion stone can be considered as an alternative to concrete causeways where engineering constraints allow for this.

3.2.2.4. Design of footing foundations

- Rock anchors are the preferred option for the installation of the panel frames into the ground, with concrete footings used only in softer areas where rock anchors cannot be used.
- Where concrete footing are proposed, the depth of surface clearance of concrete footings must be considered i.e. foundations should be limited to at least 300mm below ground surface to allow for topsoil reinstatement and revegetation over the footings. This will significantly reduce decommissioning disturbance and cost (concrete can then be left in-situ underground). If this is not considered then an allowance must be made for the removal of at least the top 300mm of concrete and reinstating topsoil over them on decommissioning.

3.2.2.5. Cable supply network

- Where underground cabling is required this should be laid in ducts to reduce site disturbance by allowing cables to be removed/replaced without having to excavate them out for maintenance/repair or on decommissioning of the facility.
- Where cable trays can be used under the panel frames to link panels this should be strongly considered, rather than installing these underground and causing disturbance of the soil vegetation crust.

3.2.2.6. Site/vegetation clearing:

- Vegetation clearing should be minimised during the construction of the facility wherever possible instead of blanket clearing of the whole site footprint, especially as rehabilitation in dry-land veld e.g. in the case of decommissioning is particularly challenging due to long recovery periods and loss of diversity. The use of ground screws/rock anchors/piles for the installation of the solar modules as opposed to larger concrete gravity footings and the use of above ground cable trays to carry cables between modules where possible would reduce the footprint area to be disturbed by clearing/excavation. Vehicle access tracks between the rows of solar modules should not be cleared or graded unless specifically required for the construction/operation equipment to operate but rather only larger shrubs and trees removed that could obstruct a vehicle. Even if retained vegetation declines due to shading underneath the solar panels, at least the soil crust and potential would remain intact to a reasonable degree, thus it should be retained undisturbed where possible.
- Note also that protected trees and vegetation should be avoided when determining the final detail approved construction footprint. Permits are required if this is not the case and lead times for applications, as required by this EMPr section 4.13.4 (5) E, must be considered. The consulting botanist shall be appointed to mark all protected trees/vegetation and seek required permits for relocation/destruction prior site clearing for construction commencing.

3.2.2.7. Stripping of top materials

- Removal of the top soil strata to protected stockpiles where excavations or surfacing occur e.g. stabilised road sections and under buildings and the re-spreading of the topsoil over concrete footings and as the top layer after excavation to utilise the natural seed bank for re-vegetation should be considered wherever this is possible.

3.2.2.8. Use of spoil materials from excavations:

- No excess spoil material from excavations is expected to be generated but there is a need to plan for the destination of spoil soils if these are in fact generated.
- Sub soils shall not be spread out as the final layer over top soils in areas where revegetation is to be encouraged.

3.2.2.9. Details of security fencing:

- Due to the relatively small size of the facility it is not deemed necessary to allow for animal movement through the fence but the fencing should not pose a significant hazard to animals either.

3.2.2.10. Stormwater management:

- A stormwater management plan must be compiled for the development. This must indicate how water velocities as a result of sheet runoff from the panels will be reduced to prevent erosion before storm water is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated (*Hoare, 2012*).

3.2.2.11. Overhead power line

- Devices to make the lines more visible to birds must be attached to the new overhead power lines installed as part of this project. The exact nature of such devices should be determined in consultation with a bird specialist. (*Hoare, 2012*)

3.2.2.12. Visual impact considerations *(van der Stok, 2012):*

- Once the final layout of the site is determined, especially if it is moved from the original position set out in the Basic Assessment Report, the viewshed must be re-checked for potential visual impacts on the adjacent Augrabies National Park. No construction should be allowed before this has been done.
- The single axis tracking arrays are to be preferred, if technically feasible, as the north/south orientation of the arrays will ensure that there are no reflection impacts on the park to the north.
- All structures are to be kept as low as possible in the landscape.
- The use of concrete is to be kept to a minimum due to its difficulty to remove at decommissioning and possible required re-shaping of the terrain to allow for its installation, affecting the visual impact of the facility.
- The gate along the R359, and any signage, is to be in line with local usages and not draw undue attention.
- All colours and finishes used for the building, water tanks and fence etc. should be specifically chosen for their ability to blend into the surrounding landscape i.e. white and bright greens are not to be used. Unpainted galvanizing of the metal components, once it has weathered, will blend well into the environment. (This excludes the panels the colour of which is fixed.)
- Excavation on the site is to be kept to the absolute minimum required for the successful implementation of the project.
- The fencing design should aim to imitate the agricultural fencing in the area while at the same time providing the security that is necessary. It is to be visually permeable. No barbed wire is to be used with preference being given to a visually acceptable electronic means of security which has a lower visual impact.
- Assisted screening of the facility may be required through the planting of groups of suitable locally indigenous trees, on the Rooipad 9/15 farm to mitigate sight lines from the Augrabies National Park towards the facility, although it is thought that the existing vegetation should be adequate for this purpose. This need shall be assessed at the end of the construction phase through discussion between the Developer, Park Manager and the ECO. The cost of the planting of up to 75 trees and irrigation during 12 months of establishment per the requirements of OEMP section 5.9.6 (5C) shall be allowed for by the Developer in case of this requirement. More trees can be planted at the Developer's discretion. Should the need for additional screening be confirmed then the trees are to be sited to mitigate specific sight lines that have been identified and the locations (GPS co-ordinates) be agreed in writing between the Developer, Park Manager and ECO. The aim of these measures must be to break the perceived scale of the facility rather than to hide it. The local thorn trees (*Acacia mellifera subsp. detinens*) are to be preferred tree species as most other species will be taller than the local vegetation and will therefore draw attention to the site/facility. However, this species is very slow growing and plants would have to be grown from seed since they would not transplant well. A botanist with knowledge of local plant species and conditions shall advise on any alternative species considered. The planting of tree lines should be avoided as this could result in a higher visual impact than that of the facility itself.
- Any necessary lighting must be shielded in such a way that no direct light is allowed to escape into the surrounding terrain or up into the sky (**refer to the guideline extract on g page 19**). Only the areas that are necessary to be lit must be lit, the surrounding terrain being protected from any undue light pollution. The use of motion senor activated security lighting as opposed to permanent flood lighting is required.

3.2.2.13. Revegetation of the site

- No artificial seeding of the pipeline routes or other areas disturbed by construction should be carried out since local grass species will re-colonize the disturbed soil (*MacDonald, 2012*).
- rehabilitation actions shall encourage the re-vegetation of the site from the natural seed bank on site e.g. reestablishment of the topsoil layer as the final graded later after grading/backfilling actions on site.

3.2.2.14. Decommissioning:

- The design of the facility and components must have possible decommissioning in mind - allow for ease of dismantling of infrastructure and re-use and recycling of components, reduce potential for soil/vegetation disturbance through decommissioning e.g. use of ducts to allow for removal of cabling, subsurface concrete footings that do not need to be removed, potential alternative uses for the operations building etc.

If the project receives and Environmental Authorisation, the detail site development plan and design to take into account the above considerations shall be submitted to DEA prior to construction commencing.

LIGHTING DESIGN GUIDELINE:

Good Neighbor OUTDOOR LIGHTING

PRESENTED BY THE NEW ENGLAND LIGHT POLLUTION ADVISORY GROUP (NELPAG) AND SKY PUBLISHING CORP.

What is good lighting?

Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned?

Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the nighttime environment and neighbors' property values.

Glare Here's the basic rule of thumb: If you can see the bright bulb from a distance, it's a bad light. With a good light, you see lit ground instead of the dazzling bulb. "Glare" is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass Poor outdoor lighting shines onto neighbors' properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

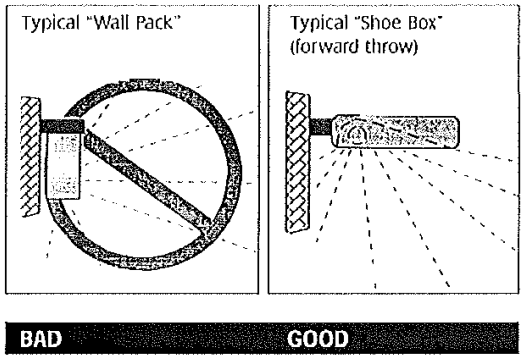
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. We waste over a billion dollars a year in the United States needlessly lighting the night sky.

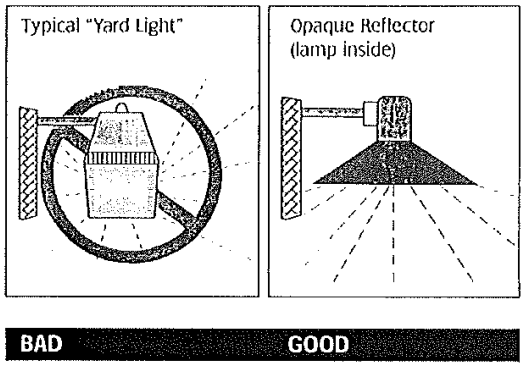
Sky Glow Rays that beam uselessly above the horizon create murky skyglow – the "light pollution" that washes out our view of the stars.

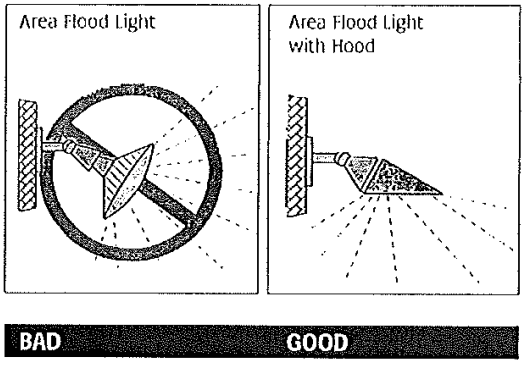
How do I switch to good lighting?

1 Provide only enough light for the task at hand; don't over-light, and don't spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the

Some Good and Bad Light Fixtures







full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbors or polluting the sky.

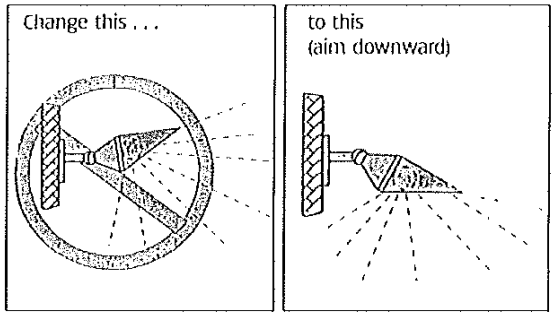
2. Aim lights down. Choose "full-cutoff shielded" fixtures that keep light from going uselessly up or sideways. Such fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.
3. Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go.

   Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as brightly as a wasteful light does with a high-wattage bulb.
4. Choose energy-efficient low-pressure sodium (LPS) or high-pressure sodium (HPS) lamps wherever yellowish light will do the job. Use less efficient white lights only where ideal color rendition is important.
5. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

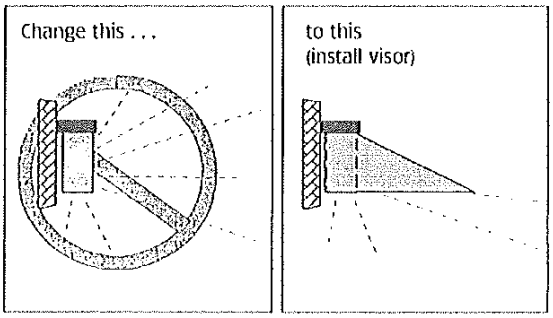
Replace bad lights with good lights.

You'll save energy and money. You'll be a good neighbor. And you'll help preserve our view of the stars.

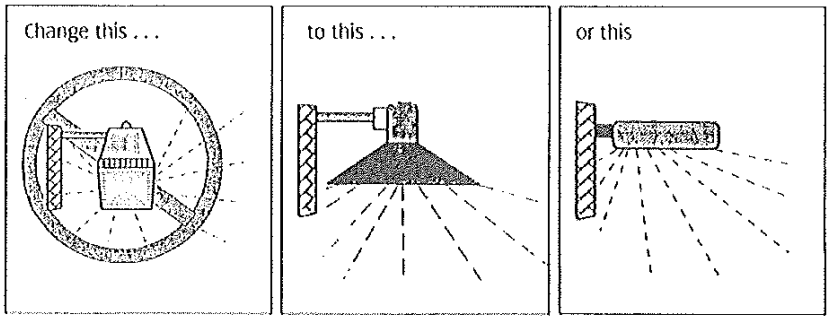
What You Can Do To Modify Existing Fixtures



FLOOD LIGHT



WALL PACK



YARD LIGHT **OPAQUE REFLECTOR** **SHOE BOX**

Presented by the
New England Light Pollution Advisory Group (NELPAG)
(http://cfa-www.harvard.edu/cfa/ps/nelpag.html) and
Sky Publishing Corp. (http://www.skypub.com/).
NELPAG and Sky Publishing Corp. support the
International Dark-Sky Association (IDA) (http://www.darksky.org/).
We urge all individuals and groups interested in the problems of light pollution and obtrusive lighting to support the IDA and subscribe to its newsletter. IDA membership costs $30 per year; send your check to IDA, 3225 N. First Avenue, Tucson, AZ 85719, U.S.A.

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3.3. DEVIATIONS FROM THE APPROVED PROJECT PLANS/CHANGE IN OWNERSHIP

Any significant changes to, or deviations from, the project description set out in the Environmental Authorisation (**Appendix 2**) which is based on the Basic Assessment Report submitted, must receive written approval from DEA before such changes may be effected. The Developer or his Principal Agent will be responsible for making such application in good time. The interpretation of what constitute significant amendments should be clarified with the DEA.

DEA shall also be notified within 30 days thereof, of any changes of ownership and/or project developer. Conditions of authorization and the contents of this EMPr must be made known to and made binding on the new owner/developer.

4. CONSTRUCTION PHASE MANAGEMENT PLAN (CEMP)

4.1. INTRODUCTION

This module provides specifications to mitigate environmental impacts anticipated during the construction phase of the Augrabies Solar Plant (including construction/installation of infrastructure as well as any initial stabilisation /rehabilitation interventions required once construction has been completed).

The main activities during construction will involve vegetation clearing, entrance gate and road construction, establishment of a lay-down area (approximately 150m²), cable trenching, foundation drilling/ concrete work, building of the control centre/operations building, installation of the water supply line, mechanical assembly of the PV module panels/frames, cable laying, electrical assembly, the installation and connection of overhead power line as well as the installation of the perimeter fence.

4.2. INTERPRETATIONS

For the purposes of this CEMP the following abbreviations and definitions shall apply:

CEMP	Construction Phase Environmental Management Plan
DEA	Department of Environmental Affairs (national department) (formerly DEAT)
DWA	Department of Water Affairs (formerly DWAF)
EA	Environmental Authorisation – issued by DEA
ECO	Environmental Control Officer
ESM	Environmental Site Manager
MSDS	Material Safety Data Sheet
SAHRA	South African Heritage Resource Agency

Bund	Enclosure under and around a storage facility to contain any spillage
Batch Plant	Site for the mixing and production of concrete or plaster, and associated equipment and materials
Contractor	The principal persons / company undertaking the construction of the development. • The main contractor as engaged by the Developer; • Nominated sub-contractors • Selected sub-contractors; and • Any other contractor from time to time engaged by the Developer directly in connection with the construction part of the works.

Developer	Developer of the project, Mulilo Renewable Energy (Pty) Ltd.
Environment	The aggregate of surrounding objects, conditions and influences that influence the life and habits of man or any other organism or collection of organisms.
Environmental Management Program	The overarching document that contains the individual environmental management plans for this project, including this Construction phase Environmental Management Plan (CEMP).
Environmental Control Officer	An external environmental consultant appointed by the Developer to periodically monitor the level of implementation of the CEMP/EA and suitable environmental management practices on site during the construction phase of the project and responsible for reporting to the environmental authorities.
Environmental Site Manager	An individual appointed by the Developer to ensure the day to day implementation of the CEMP and suitable environmental management practices on site for the duration of the construction phase of the project. This designation can be a staff member or representative of the Developer or Contractor.
Licensed Landfill Site	Dumpsite for waste that has been licensed in terms of the National Environmental Management: Waste Act 59 of 2008 or the Environmental Conservation Act 73 of 1989.
Local Authority	Kai! Garieb Municipality
"No-go" Areas	Areas identified as being environmentally sensitive in some manner and delineated on plan, and on the site with pegs or fencing and which are out of bounds to unauthorised persons. Authorisation must be obtained prior to entry.
Principal Agent	Person representing the Developer on site and who is responsible for the technical and contractual implementation of the works to be undertaken. This is usually the Engineer, but may be any other person, such as a project manager authorized by the Developer to fulfil this role.
Site	The boundary and extent of development works and infrastructure, including any areas off the main site on which works are to be carried out in order to allow the development to proceed successfully.
Structure	Means any man-made feature affixed to the ground or attached to something located on the ground, including but not limited to fences, walls, berms, levees, fill, storage tanks, shelters or buildings.
Stormwater	Water resulting from natural precipitation and/or accumulation and includes rainwater, groundwater and spring water, but excludes water in a water or wastewater reticulation system.
Topsoil	The top 150 mm of soil; may include vegetation and rocks
Works	The construction operations and all related and incidental works, such as site works, earthworks, installation of services, rehabilitation etc, carrying to completion of the development.

4.3. IMPLEMENTATION OF THE CEMP

This CEMP document describes mitigation measures in detail, identifying specific people or organisations to undertake specific tasks, in order to ensure that impacts on the environment are minimised during the construction phase of this project. The CEMP is applicable to all works comprising the development of this project, including works outside of the site boundaries e.g. water supply lines, overhead transmission lines etc that may form part of the project works. It is an open-ended document implying that information gained during construction activities and/or monitoring of procedures on site could lead to changes in the CEMP.

All identified responsible parties are expected to co-operate closely to minimise or avoid unnecessary environmental impacts.

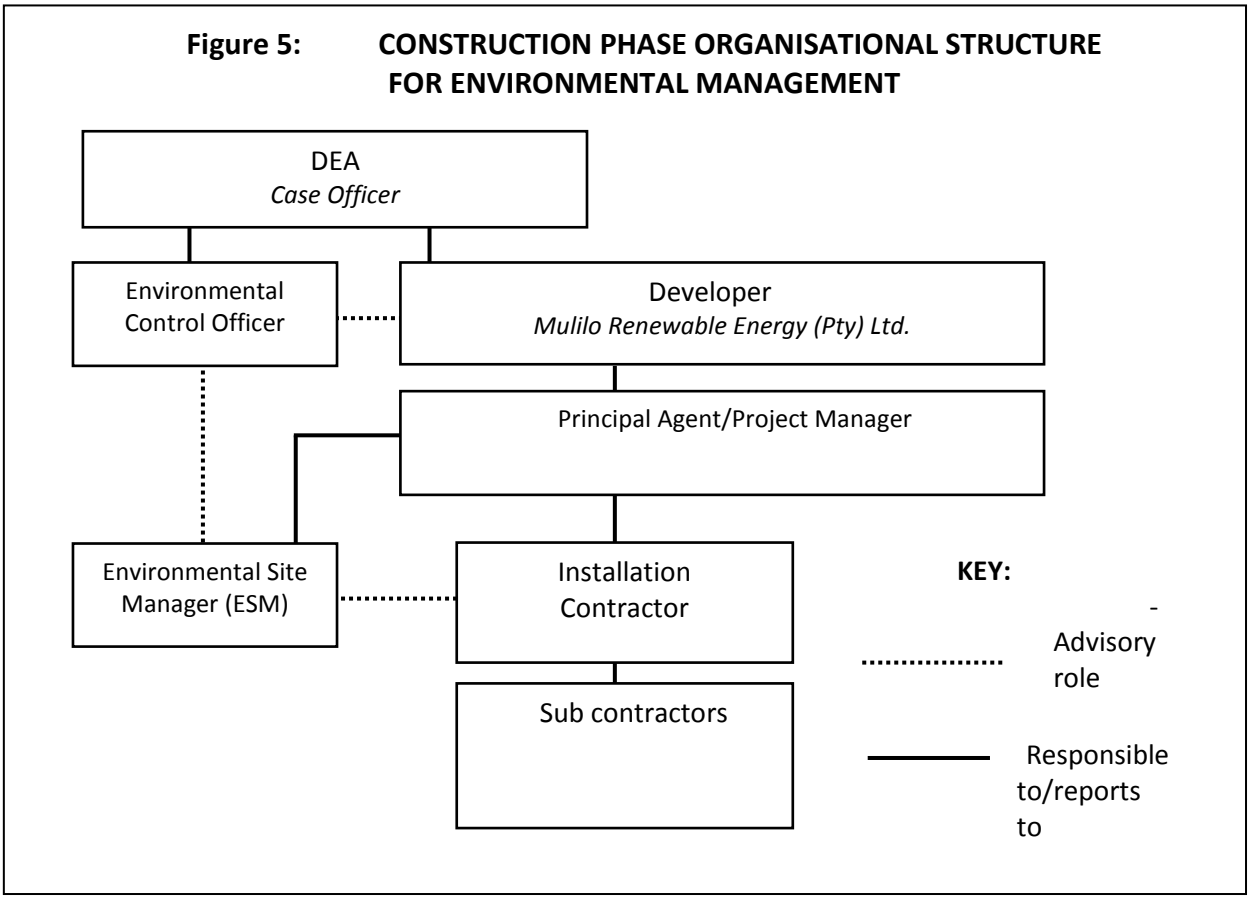
Non-compliance penalties are described in this CEMP and the CEMP is thus **to be included into the official contract documentation of each of the principal contractors appointed to the project**. The Developer and Contractor are obliged to inform the DEA immediately of events that have/will cause serious environmental damage or of any breaches of the Environmental Authorisation.

4.3.1. Responsibilities and Organizational Structure

The key role-players during the construction phase of the development, for the purposes of environmental management on site include, but are not limited to: the Developer, the Contractor and his Principal Agent for construction works, the Environmental Control Officer, designated Environmental Site Manager and representatives of the relevant Authority/ies.

Lines of communication and reporting between the various parties are illustrated in **Figure 5** below. Details of the responsibilities of each of the key role-players have been provided in sections 4.3.2 -4.3.6 below.

Figure 5: CONSTRUCTION PHASE ORGANISATIONAL STRUCTURE FOR ENVIRONMENTAL MANAGEMENT



4.3.2. The Developer

The Developer refers to Mulilo Renewable Energy (Pty) Ltd. who is ultimately responsible for compliance with all conditions of approval of the development or any aspect thereof by any authority.

With respect to the construction phase of the Development, the Developer is to:

- ensure that all relevant approvals and permits have been obtained prior to the start of construction activities on site;
- ensure that the requirements as set out in this CEMP and the Environmental Authorisation issued by the DEA (**refer to Appendix 2 of the EMPr**) and any other conditions of approvals by the relevant Authorities are adhered to and implemented by the Developers and any person on their behalf incl. agents, employees, contractors etc.;
- appoint a suitably qualified independent Environmental Control Officer* to undertake external environmental compliance monitoring per the requirements of this CEMP;

* A suitably qualified experienced Environmental Control officer is deemed to comply with the following:

a) has a tertiary qualification in environmental management or natural sciences;
b) has previous experience in environmental monitoring of a project which constitutes a listed activity under regulations promulgated in terms of the Environmental Conservation Act, 73 of 1989 or alternatively the National Environmental Management Act, 1998.
c) Has 3 yrs experience in some form of environmental management (not necessarily monitoring).
d) Or is indirectly qualified by working under the direct supervision of a person qualified in terms of (a),(b) and (c) above.

- designate a person to act as the Environmental Site Manager responsible for ensuring the day to day implementation of the CEMP on site prior to the start of construction activities on site, and for the duration of the construction phase;
- ensure that DEA is given at least one week's written notice prior to the construction start including name and contact details of proposed ECO;
- provide all principal contractors working on the project with a copy of this CEMP as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts.

4.3.3. The Principal Agent

For the purposes of this document this designation refers to the representative of the Developer who is responsible for the technical and contractual implementation of the works/part of the works to be undertaken.

The responsibilities of the Principal Agent are to:

- ensure that the requirements as set out in this CEMP and by the relevant Authorities are adhered to and implemented (on the behalf of the Developer);
- assist the ESM/ECO in ensuring that the conditions of the CEMP are being adhered to and promptly issuing instructions requested by the ESM/ECO, to the Contractors undertaking the construction works on site. All site instructions pertaining to environmental matters issued by the Principal Agent are to be copied to the ESM;

- assist the ESM and ECO in making decisions and finding solutions to environmental problems that may arise during the construction phase;
- reviewing and approving construction method statements with input from the ESM/ECO;
- ordering the removal of person(s) and/or equipment not complying with the specifications or issuing a stop works order (as required by the ECO or otherwise);
- issuing of penalties for transgressions of environmental site specifications;
- providing input into the ESM/ECO's ongoing internal review of the CEMP.

4.3.4. The Contractor

For the purposes of this document "The Contractor" refers to any directly appointed company or individual undertaking the implementation of the works.

The Contractor is to:

- ensure implementation of all applicable Environmental Management Specifications in this CEMP as well as all additional requirements related with approved method statements, during all works on site, failing which penalties, as outlined in the environmental management specifications may be imposed by the Principal agent/ECO;
- ensure that all of its sub-contractors, employees, suppliers or agents etc. are fully aware of the environmental management requirements detailed in the Environmental Management Specifications;
- to environmentally educate and raise the awareness of the contractor's staff on site as to the environmental requirements relating to the Site and to facilitate the spread of the correct attitude during works on Site;
- liaise closely with the Principal Agent and the ESM and ensure that the works on site are conducted in an environmentally sensitive manner;
- inform the Principal Agent as well as the ESM should environmental issues on site go wrong, e.g. dumping, pollution etc;
- carry out instructions issued by the Principal Agent, on request of the ESM, required to fulfil his/her compliance with the CEMP.

4.3.5. Environmental Site Manager

The Environmental Site Manager is an individual appointed by the Developer to ensure the day to day implementation of the CEMP and suitable environmental management practices on site for the duration of the construction phase of the project. This designation can be a staff member of the Developer or Contractor or an external appointment.
The ESM's duties, inter alia, must be to facilitate compliance with the CEMP on an ongoing basis during the construction phase through monitoring and proactive and open communication channels with the project/site management as well as liaison and reporting to the ECO. The ESM's responsibilities include the following:

- monitoring and verifying that the CEMP and Environmental Authorisation issued by DEA is adhered to by inspecting the Site and surrounding areas regularly (minimum weekly, more frequently if required during the construction start up period and during environmentally sensitive work) during periods of active construction with regard to compliance with the CEMP and notifying the Principal Agent if the specifications are not followed;
- reviewing and approving construction method statements together with the Principal Agent and ECO;
- assisting the Principal Agent in finding environmentally responsible solutions to problems;

- keeping records of all environmental incidents/issues on Site in a Site Inspection Report book and completed Incident Report forms for significant incidents/non-compliances that result in environmental damage;
- Keeping a register of complaints and report these first to the Principal Agent for action / follow-up;
- completing start-up, weekly compliance and site closure checklists – refer to Appendix 3 of this CEMP to be submitted to the external ECO;
- keeping a photographic record of progress on Site from an environmental perspective;
- keeping copies of all of the above and other relevant documentation in an environmental site file which must be made available to the external ECO during site inspections;
- undertaking a continual internal review of the CEMP and making amendment recommendations to the ECO if required.

4.3.6. Environmental Control Officer

The Environmental Control Officer (ECO) is an external environmental consultant appointed by the Developer to periodically and independently monitor the level of implementation of the CEMP on site under the guidance of the ESM during the construction phase of the project.

The ECO is to undertake the following:

- conducting a site inspection prior to the start of construction and taking a photographic record of the site and its immediate surrounding area to serve as a baseline for measurement of all future visual impacts and as an aid to the full rehabilitation of the site should the facility be decommissioned in future.

- conducting a site inspection and auditing compliance of the CEMP as follows:

  a) during site clearing activities and specifically confirming site establishment, environmental training, ESM record keeping protocols and site demarcation protocols, following which a report detailing levels of compliance is to be forwarded to the ESM, project team and case officer at DEA;

  b) every 2 months after the first audit (during periods of active construction) specifically confirming ongoing compliance with the CEMP and Environmental Authorisation;

  c) Upon completion of the construction activities followed by the compilation of a final construction closure statement for the project, completed when all works related to the project have been completed and the site has been cleared of all construction related debris, materials and/or equipment not forming part of the permanent works. This will be submitted to DEA in order to achieve “environmental closure” of the site.

- The ECO has the authority to recommend to the DEA that works be stopped, if in his/her opinion serious harm to, or impact on, the environment is imminent, is likely to occur or has occurred and such actual or potential harm or impact is in contravention of this CEMP or Environmental Authorisation, and which is, or may be, caused by construction, or related works. This would only take place in urgent / emergency cases, or when there is conflict with the Principal Agent.

- The ECO shall "remotely" assist the ESM with recommendations for improved environmental management between compliance audits based on written correspondence and photographs. This includes comment on Environmental Incident Reports (refer to section 4.13.21) The ECO should be invited to attend and where possible synchronise audits with any site meetings during the period of construction. ECO must be copied with all site meeting minutes.

4.3.7. Environmental Education Programme

The principal contractor shall make his permanent site staff available to attend environmental awareness courses presented by the Contractor SHE manager/ESM or ECO and as part of routine Health and Safety induction courses presented by the contractor, per the requirements of this CEMP **section 4.13.1** to familiarise them with the environmental aspects of the CEMP and code of conduct on site.

Information posters pertaining to the material above shall be posted conspicuously at the site camp on site, particularly near canteen or locker areas.

4.3.8. Method Statements

The Contractor may be required to provide Method Statements prior to work commencing on aspects of the project deemed or identified to be of greater risk to the environment and/or which may not be covered in sufficient detail in the CEMP, when called upon to do so by the Principal Agent or ECO.

A Method Statement describes the scope of the intended work in a step-by-step description in order for the ECO, ESM and the Principal Agent to understand the Contractor's intentions. This will enable them to assist in devising any mitigation measures, which would minimise environmental impact during these tasks. For each instance where it is requested that the Contractor submit a Method Statement, the template provided in **Appendix 4 of this CEMP** should be used to guide the submission.

All Method Statements are to be to the satisfaction of the ESM, ECO and Principal Agent. Changes to, and adaptations of, Method Statements can be implemented with the prior consent of all parties.

A list of some of the Method Statements that the Contractor may need to submit during the course of the construction contract has been provided in CEMP section 4.13.1, along with an indication of those which the ESM may require the Contractor to provide prior to the start of works on site.

Approved Method Statements shall be readily available on the Site and shall be communicated to all relevant personnel and sub-contractors. The Contractor shall carry out the works in accordance with the approved Method Statement.

4.3.9. ESM Inspection Log

The ESM will maintain on file, site inspection report logs/an environmental site diary that record environmental issues as they occur on site for record keeping purposes. Comments from these site inspection reports will form part of weekly inspection report checklists.

4.3.10. Site Memo Entries

Site memos, stipulating recommended actions required to improve compliance with the CEMP by the Contractor will be issued by the ESM/ECO to the Principal Agent and the Contractor.

Comments made by the ESM/ECO in the Site Memo's are advisory and all Site Instructions required may only be issued by the Principal Agent.

4.4. OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS

The Contractor is to take cognisance of the Occupational Health and Safety Act (Act 85 of 1993) and in particular the requirements of the Construction Regulations issued in July 2003. Compliance with its requirements will be audited by the Contractor's Health and Safety Agent. The ESM & ECO are to be copied with all safety reports.

4.5. DISPUTE RESOLUTION

Any disputes or disagreements between appointed Contractor and the Principal Agent shall be resolved as per the relevant dispute resolution clauses contained within the GCC - General Conditions of Contract (civil works) and JBCC - Joint Building Contracts Committee (building works) contract documentation respectively.

Where any disputes or disagreements arise between the Principal Agent and the ESM or ECO, specifically with regard to environmental management on Site and which cannot be resolved, then the matter will be referred to the case officer at DEA for clarification and their decision is binding on all parties. The DEA can be requested to delegate the investigation into the dispute and resolution to a case officer at DEA&DP if required to expedite the matter.

4.6. CONTRACTUAL CONFLICTS

In the event of any conflict occurring between the provisions of the CEMP and the project specifications contained within other project documentation, the terms within the CEMP shall take preference.

4.7. AUTHORITY INSPECTIONS

Officials from DEA e.g. environmental management inspectors, and other government officials e.g. Department of Labour inspectors, DWA, SAHRA officials etc. shall be given access to the property for the purpose of assessing and/or monitoring compliance with the conditions contained in the Environmental Authorisations, issued permits or legislation, at all reasonable times.

A copy of the Environmental Authorisation (**Appendix 2 of the EMPr**) must be kept by the Contractor on the construction site at all times and must be produced to any authorised official of DEA who requests to see it.

4.8. COMMUNITY RELATIONS

The Contractor shall be responsible for responding to third party or public queries and/or complaints relating to construction operations. The Developer shall be responsible for dissemination of information to the community and the media (press releases etc).

The Contractor shall notify the ESM and the Principal Agent of any complaints lodged. The Contractor shall be responsible for maintaining a Complaints Register to record complaints received and action taken. This shall be made available to the ECO for review.

4.9. SOCIAL RESPONSIBILITIES

The Contractor shall encourage and implement wherever possible the procurement of locally based labour, skills and materials as well as skills transfer to staff working on the project.

This includes:

- maximizing opportunities to local and regional SSMEs and other businesses to provide a range of services, which may include, but not limited to, security, building materials, transport services;
- preparation of a labour recruitment strategy to maximise job opportunities for people from the Augrabies area;
- Skills transfer to unskilled labour;

Adequate on-site management and training of construction crews is required, mainly in order to manage risks related to infrastructural damage, veld fires and stock losses on site and adjacent farms.

4.10. REVIEW OF THE CEMP

The project team is to constantly assess the practicality and effectiveness of the CEMP and report any problems and suggested amendments to the ECO.
Any substantial changes, updates or upgrades of the CEMP must be approved by the ECO and be sent to the DEA for information and file within 14 days of such changes being made to the CEMP.

4.11. NOTIFICATION OF CONSTRUCTION START

One week's notice, in writing, must be given to DEA, before commencement of the *initial* construction activity on the site (thus entrenching the EA within its validity period). This must include confirmation of the designation of the ECO for the project and their contact details. This must be undertaken by the Developer or his representative.

4.12. STRUCTURE OF MANAGEMENT SPECIFICATIONS

The management specifications are set out as follows:

1. **Legislated Requirements**
   Some of the most pertinent legislation, but not necessarily a comprehensive list, that applies to each management section.

2. **Background**
   Background to site-specific conditions and/or the environmental impact being mitigated.

3. **Objectives**
   What the management specifications are trying to achieve.

4. **Performance Indicators**
   Identifies indicators that demonstrate the level of compliance with a procedure.

5. **Procedures**
   The actual management specifications that aim to avoid or mitigate potential environmental impacts.

6. **Monitoring and Reporting**
   Describes the frequency and type of monitoring of each management section and how and in what forum this is reported on.

7. **Responsibilities**
   Describes who is responsible for what in terms of implementing the management specifications.

8. **Related Documents**
   Describes related documents that may exist containing guidelines or requirements related to the environment.

9. **Breach**
   Describes enforcement and remedial actions that apply in the case of a contravention with a management procedure/section in the CEMP.

4.13. MANAGEMENT SPECIFICATIONS

The management specifications applicable to the construction phase of the development follow:

EMP SECT 4.13	1. SITE ESTABLISHMENT		
Version no	01	***Date***	December 2013

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993)

2. Background

- A temporary construction site camp is required during the construction phase. This includes a lay down and storage area to accommodate the assembly of the PV panel equipment and other materials, a site office, toilet facilities and eating areas for construction staff.
- It is suggested that the operations building will be constructed first so that it can be used as the site office and as a base for security staff during the construction phase.

3. Objectives

- Plan construction methods that result in the least possible negative environmental impact and document these as Environmental Method Statements.
- Increase the level of compliance with the environmental specifications contained in the CEMP by raising awareness of the requirements in environmental awareness training courses at all staff levels.
- Minimize environmental impact by siting the site camp/lay down area elements in areas where they have the least possible negative environmental impact whilst still being practical to the works.
- Provide staff welfare facilities including toilets, drinking water and eating areas.

4. Performance Indicators

- All environmental method statements are provided by the Contractor prior to commencing with the activities governed by such method statements and are kept on file on site.
- Environmental awareness training registers are on file on site.
- The site camp and lay-down area is located in the approved position and its footprint minimized and demarcated, with no undue avoidable environmental impact e.g. on natural vegetation, stormwater drainage, visual impact etc.
- Adequate toilet facilities are provided and are maintained in a hygienic condition. No spillage of content of chemical toilets on the site.
- Eating areas and drinking water provided to site staff in an easily accessible position.

5. Procedures

A. Method Statements

- The Contractor shall provide all environmental method statements requested in writing by the Principal Agent/ECO for the ECO's approval a minimum of 7 days prior to commencing with the activity addressed in each method statement.
- Approved Method Statements shall be readily available on the Site and shall be communicated to all relevant personnel and sub-contractors. The Contractor shall carry out the works in accordance with the approved Method Statement.
- The following method statements may be required by the Principal Agent/ECO (not an exclusive list):

4.13.1. Site camp and site division

The location, layout and method of establishment of the construction camp (including all sheds, offices, access routes, lay down yards, fuel storage areas, batching areas and other infrastructure required for the running of the project).

4.13.2. Vegetation clearing

Method of vegetation clearing during site establishment and disposal procedure for cleared material. Include a plant/animal search and rescue program.

4.13.3. Fuel storage and use

The design, location and construction of the fuel storage area, service areas as well as for the filling and dispensing from storage tanks and management of drip trays.

4.13.4. Restriction of working areas

The position, type and height of all permanent and temporary fencing / pegging required for the demarcation of working and protected ("no-go areas") areas respectively. Include a program of installation.

4.13.5. Waste management

Expected solid and liquid waste types, quantities, methods and frequency of collection and disposal as well as location of disposal sites. Include a recycling programme as part of a Waste Management Plan.

4.13.6. Hazardous substances

Details of any hazardous substances / materials to be used, together with the transport, storage, handling and disposal procedures for the substances.

4.13.7. Cement and concrete batching

Location, layout and preparation of concrete batching areas including the methods employed for the mixing and handling of cement products and particularly the containment of excessive runoff and waste water from such areas, the method of transportation of concrete and containment of cement dust.

4.13.8. Emergency procedures

Emergency procedures for fire and accidental leaks and spillages of hazardous substances (including fuel and oil). Include details of risk reduction measures to be implemented including fire fighting equipment, fire prevention procedures and spill kits (materials and compounds used to reduce the extent of spills and to breakdown or encapsulate hydrocarbons).

4.13.9. Dust

Details on the methods for managing dust on the site during the construction phase.

4.13.10. Special environments

Details on the methods for working in close proximity to any protected feature on or adjacent to the site e.g. significant drainage line, including demarcation of works area, stockpile locations and rehabilitation actions.

B. Environmental Awareness Training

- The Contractor shall present important environmental requirements (**per Appendix 4**) as part of the compulsory Health and Safety induction meetings presented to all new site staff and sub contractors on site within a week of their arrival on site.

C. Site camp

- The location of the Contractor's construction site camp, and material lay down areas shall be specifically discussed and approved in writing by the Principal Agent, ESM and ECO prior to the establishment and shall make use of areas of low ecological sensitivity within the facility site footprint.
- The site camp shall not be located within the 1:100 year flood line or within 100m (whichever is greatest) from any water course.
- The site camp/lay-down areas shall be limited in area to only that which is essential and its extent shall be fenced or pegged for the duration of its lifespan on site.

D. Toilets

- A minimum of one chemical toilet for every 15-contract personnel or alternatively 1 flush toilet for every 30 personnel, is to be provided on site in any given work area. All employees on site shall have easy access to these facilities (within 100 meters of their work site). A trailer mounted toilet may be considered to achieve such accessibility in work areas further away from the construction camp.
- Toilets must have doors and locks and portable chemical toilets shall be secured to prevent them from blowing over. Toilet paper shall be provided.
- The Contractor shall ensure that suitable sanitation facilities are provided for and/or by all his sub-contractors on site.
- The Contractor shall keep the toilets in a clean, neat and hygienic condition and chemical toilets shall be serviced at least once per week.
- Chemical toilets are to be emptied prior to builder's holidays/temporary closure of more than 10 days. The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

E. Drinking water

- The Contractor shall ensure that drinking water is available for all staff on site. If no potable water source is available on site at any time then the Contractor shall import drinking water to the site.

F. Eating areas

- If employees are to eat elsewhere on site other than in the campsite/office area, the Contractor shall designate restricted, sheltered places for eating within the specified working areas. The Contractor shall provide adequate refuse bins with lids in all these places.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.

- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic (average every 2 months) summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, call for environmental method statements, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 (Enforcement)** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies for failure to provide adequate toilet facilities in a hygienic condition, drinking water or eating areas for site staff.
- A penalty of R 500 day per method statement applies for failure of the Contractor to provide method statements within the allocated time frames.
- If the Contractor fails to provide and/or maintain all site sanitation facilities in a clean and hygienic condition, the Principal Agent may order the Contractor to suspend any or all work on the site until these requirements are met. No payment shall be made for any delays caused thereby nor shall extensions of time be granted for such delays.
- The cost of remediation will apply for a site camp located in an unapproved location where it results in negative environmental impacts.

EMP SECT 4.13	2. SITE CLEARANCE AND EARTHWORKS		
Version no	01	***Date***	December 2013

1. Legislated requirements

- National Environment Management: Air Quality Act (No. 39 of 2004)
- National Heritage Resources Act (no. 25 of 1999)
- National Environmental Management: Waste Act 59 of 2008
- Occupational Health and Safety Act (No 85 of 1993) - Hazardous Substances Regulations

2. Background

- Some vegetation clearance is required for the new access and main internal road, cable trenches, in and just around the footprint of the maintenance facility.
- No large excavations are needed for this development, though some excavation may be required for panel footings, the operations building and roads.
- A topsoil surface layer is required for the successful re-vegetation of disturbed sites.
- Artefacts may be uncovered during excavations on site.

3. Objectives

- Rescue any animals or plants feasible for transplant impacted by site clearance activities.
- Save topsoil from site for re-use where feasible.
- Safe and responsible disposal of waste materials resulting from site clearance.
- Avoid destruction of historical artefacts should any be unearthed during excavations.

4. Performance Indicators

- No injured animals as a result of site clearing.
- No destruction of plants that were identified for rescue and relocation.
- Required permits in place for the destruction/transplant of any tree/plant species protected in terms of legislation.
- Topsoil separated and conserved for re-use where feasible.

5. Procedures

A. Vegetation Clearance

- The fencing/pegging off of the extent of the approved work areas shall occur prior to the commencement of site clearing works at those locations.
- Vegetation clearing and soil crust disturbance must be kept to the absolute minimum required to develop the project.
- Plant waste material removed from the site is not to be dumped anywhere other than a site approved by the Principal Agent and the ESM. Where possible, it shall rather be chipped to be used on site as a stabilising mulch layer in vegetation rehabilitation areas.
- Note that a permit will be required prior to the destruction of any species protected by legislation as described in CEMP 4.13.4 (5) E Protected Vegetation on p. 43.

B. Animal Search and Rescue

- The Contractor shall carefully monitor site clearing activities and shall organise with the ESM for the rescue of all animals that cannot move off on their own e.g. ground nesting birds, tortoises, snakes etc.
- Rescued wild animals shall be relocated to adjacent natural areas on the farm where they will not be impacted by construction activities. Species and numbers of relocated animals shall be recorded and kept as part of the ESM records.

C. Plant Search and Rescue

- *Aloe claviflora* (per photo left) and any other plant species identified for rescue by the botanist or ECO e.g. bulb species, shall be removed from each area prior to site clearing commencing. Such plants shall be directly transplanted into new locations on site outside of the disturbance footprint (identified by the ECO for this purpose).
- Note that a permit will be required prior to transplant of the *Aloe* sp. or other protected species as described in CEMP 4.13.4 (5) E *Protected Vegetation* on p. 43.

D. Earthworks

- Topsoil that is stripped from the site during the earthworks operation shall be retained for future rehabilitation use, where feasible and of an acceptable quality and shall be stored in areas on site demarcated by the ESM and Principal Agent and in wind rows/stockpiles not higher than 2m. The stockpiles shall not be compacted or disturbed, and shall be domed at the top to promote runoff. Should significant erosion (e.g. through rain or wind) of the stockpiled material occur, the stockpiles may be seeded with stabilising grasses or covered with Geotech fabrics or similarly suitable material to prevent such erosion.
- Subsoil from excavations shall be spoiled in a location approved by the Principal Agent, ESM and ECO or may be spread in disturbed areas where the topsoil layer will be reinstated on top as part of the rehabilitation process.

E. Excavation and trenching

- During excavation and trenching activities, care is to be taken to ensure that the stockpiling of top material is kept separate from sub-soils. Top material saved is to be replaced as top material and is to serve as the final layer when back-filling. The Contractor shall reinstate all working areas to the satisfaction of the Principal Agent, ESM and ECO.
- Trenches and excavations are to be closed as soon as possible after services have been laid in them, to prevent them from posing safety hazards to people, traffic and animals and to prevent rainwater erosion.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.

- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 4 Restriction of Working Areas and Protection of Sensitive Features** and **Specification 5 (Waste Management)** of this CEMP.
- Refer to **Specification 20 (Enforcement)** of this CEMP.

9. Breach

- A penalty of R500 - 10 000 per incident applied to malicious or negligent harm to a wild animal encountered on site or plant species designated for relocation.
- Penalty of R100 - R500 per square meter of vegetation cleared beyond the agreed site clearing footprint.
- Contractor/applicant may be liable for prosecution for damaging/transplanting protected plant species without the required permits.
- The cost of remediation for a spoil site located in an unapproved location where it results in negative environmental impacts.
- The cost of imported topsoil of similar type to replace topsoil that the contractor has failed to strip or protect resulting in its loss to the project.

EMP SECT 4.13	3. FUEL/FLAMMABLES STORAGE AND HANDLING		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993) - Hazardous Chemical Substances regulations (25 August 1995)

2. Background

- Petrol, diesel, solvents and other flammable substances may be stored and used on site.
- There are associated fire risks to such activities as well as environmental pollution risks to soil and ground water in the case of spills.

3. Objectives

- Prevent spillage and undue fire risks associated with the storage and handling of fuels and other flammable substances.

4. Performance Indicators

- Adequate storage facilities including approved location, ventilation and bunding.
- No spills or accidental spills adequately treated.
- Required drip trays in place.

5. Procedures

A. Storage

- All fuels/flammable substances are to be stored within a demarcated area in the Contractor's camp on site.
- The storage area and perimeter must be free of vegetation and be well away from buildings or stored combustible materials.
- The Contractor shall ensure that all liquid fuels (petrol and diesel) and other flammable substances are stored in containers with lids, which are kept firmly shut. All containers must be in such a condition as to be reasonably safe from damage and to prevent leakage there from. The rated capacity of a tank/container must be able to accommodate expansion of the product contained therein due to the rise in temperature during storage.
- Only empty and externally clean containers may be stored on the bare ground. Containers containing fuels as well as all empty and externally dirty containers shall be situated on a smooth and level impermeable surface (concrete floor) and must be contained within a bund wall. The volume inside the bund shall be equal to 110% multiplied (x) by the total capacity of all the storage containers/tanks.
- The person in charge of a flammable store must ensure that the flammable store doors are kept locked when the store is not in use.
- Sufficient fire-fighting equipment/extinguishers must be provided in an easily accessible position and in close proximity to all areas used for the storage and / or handling of fuel and other flammable substances.

B. Handling

- All vehicles and equipment must be maintained in a good condition in order to minimise the risk of leaks and possible contamination of the soil or stormwater by fuels, oils and hydraulic fluids.
- All vehicles / plant requiring servicing, or which are parked on site overnight and found to leak oils, as well as any static plant e.g. generators and concrete mixers leaking fuels and oils, are to make use of a drip tray placed strategically to avoid incidental spillage of oils and fuels onto the ground. Drip trays shall be inspected at least weekly (daily, if affected by rainwater) and appropriate mop up products used to remove spills. In particular, drip trays shall be closely monitored during rain events to ensure that they do not overflow.
- No servicing of machinery may take place within 100meters/1:100 year flood line of any water course.
- A suitable leak proof container for the storage of oiled equipment (filters, drip tray contents and soiled mop-up products, oil changes, etc.) must be established.
- All fuel, oil or hydraulic fluid spills are to be reported to the Principal Agent and ESM immediately and be treated according to the protocols for hydrocarbon spills detailed in **Specification 16 Emergency Management** of this CEMP.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 16 Emergency Management** and **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies for poor flammable substances storage that is seen as potential fire risk and failure to treat significant (more than 5 litres) or identified spills.
- The cost of remediation will apply for significant fuel spills due to the Contractors negligence to comply with these specifications.

EMP SECT 4.13	4. RESTRICTION OF WORKING AREAS AND PROTECTION OF SENSITIVE FEATURES		
Version no	01	***Date***	December 2013

1. Legislated requirements

- National Environmental Management Act (No 107 of 1998)
- National Heritage Resources (Act No. 25 of 1999)

2. Background

- The areas of natural vegetation outside of the infrastructure footprint (< 20 Ha site) are termed no-go areas for staff.
- The stone cairn to the west of the facility site is a no-go area to all construction staff.
- Archaeological/paleontological artefacts may be discovered on site (e.g. during excavation of PV panel and transmission line pole footings) which, if discovered, would need to be protected during the construction phase and reported to the heritage authorities so that appropriate mitigation action can be taken if required.
- Protected trees and vegetation may need to be destroyed if they in the way of the final approved construction footprint. Permits are required if this is the case and lead times for applications must be considered.

3. Objectives

- To identify any sensitive features/areas or safety risks areas and to minimise the potential for damage or disturbance to these through construction activities.

4. Performance Indicators

- Sensitive features, protected vegetation, areas outside the work site boundaries etc, termed as "no-go" areas, are designated clearly by means of suitable demarcation fencing/pegging where these are close to the work sites and there is a danger of accidental damage /staff ingress.
- Sensitive features remain intact and undamaged.

5. Procedures

A. Demarcation

- The disturbance of the natural environment is to be kept to within the 20 ha. boundary of the site and the access road from the R359. All site camp/lay down areas shall be included in this footprint.
- Before commencing any construction work in a given area, the Contractor shall, in order to prevent unauthorized movement of persons or vehicles outside designated working areas and access routes and protect sensitive features on and adjacent to the site, erect suitable demarcation fencing/pegs to indicate the boundaries of the works area/protected areas/access routes, as may be required the Principal Agent, ESM and ECO where they deem the sensitive feature to be at risk.
- Movement of vehicles and personnel, stockpiling, dumping or storage of equipment or materials outside the designated working areas (e.g. outside the boundaries of the site; in rehabilitation areas etc.) termed as “no-go” areas, will not be permitted without written authorisation of the Principal Agent.

- Watercourse crossings shall be limited in number to the absolute minimum necessary and demarcated and no others crossing points shall be used.

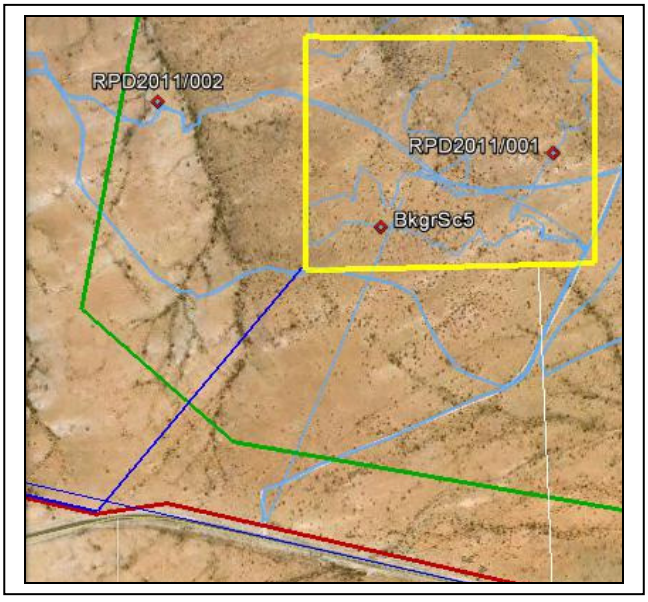
B. Fencing Specification

- Temporary or safety fencing shall (unless otherwise specified by the Principal Agent) consist of wooden or metal posts at 3m centres with two plain wire strands tensioned horizontally at 500mm and 900mm from ground level. Danger tape shall be wrapped around the wire strands. The Contractor shall maintain the fence for the duration of the contract and ensure that the danger tape does not become dislodged and cause litter.
- Temporary works area demarcation pegging shall consist of flagged droppers positioned at minimum 5 meter intervals.
- Alternative fencing specifications are to be approved by the Principal Agent and ECO.

C. Safety/Access Control fencing

- Access control to site and the fencing of areas with potential hazards to staff/visitors shall be considered in consultation with the Developer's Health and Safety agent.

D. Heritage features



- The stone cairn/grave beyond the western boundary of the site (RPD2011/002 in the diagram to the left) must not be accessed by construction staff. The ECO must be aware of the potentially very high significance of stone cairns and should ensure that any revised footprint location will not impact on any other stone cairns or indeed any rocky ridges or outcrops not previously identified/included in the design footprint, without authorisation from the South African Heritage Resources Agency (SAHRA).
- While not envisioned at the time of drafting of this EMPR, any alterations or proposed demolition of structures older than 60 years are subject to a permit in terms of Section 34 of the National Heritage Resources ACT (NHRA).
- All artefacts over 60 years of age and all fossils are protected by law. Should anything of potential heritage significance be found on site by the Contractor (or any other party), e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, marine shell and charcoal/ash concentrations, unmarked human burials, fossils or other categories of heritage resources, work is to be stopped in the area immediately, and the ESM / Principal Agent notified. Failure to notify such of a find will result in a penalty. This aspect must be carefully explained to workers during the Environmental Education Programme.
- The ESM shall record (photos and GPS location) and safeguard any suspected artefacts/fossils and will advise on demarcation of this area and, where impacted by the construction footprint, notify a relevant specialist to view material and ascertain whether further recovery of the artefact or further study of the area is required (at the Developer's expense).

- Should a specialist confirm a genuine artefact or fossil and recommend further study of the area, work in the applicable area is to cease until further notice and SAHRA (Jenna Lavin/Colette Scheermeyer @ 021 462 4502) is to be informed immediately by the Principal Agent.
- If the newly discovered heritage resources prove to be of archaeological or paleontological significance a Phase 2 rescue operation might be necessary. The removal of discovered archaeological/paleontological remains by a contracted archaeologist/palaeontologist shall be at the Developer's expense.
- Should any human remains be disturbed, exposed or uncovered during excavation, these shall immediately be reported the South African Police Service. If suspected that the remains are older than 60 years, the South African Heritage Resources Agency shall similarly be contacted. Exhumation may be required at the expense of the developer.

E. Protected vegetation

- Any vegetation identified and specifically marked for protection by the botanist/ESM/ECO e.g. trees shall be fenced in areas where there is any chance of such being damaged by construction/contractor activities as per an approved Method Statement.
- No tree protected in terms of legislation (in terms of the National Forests Act, Act 84 of 1998 as amended, section 12(1)(d) read with section (15(1) and section 62(2)(c) and the listed species in GN 716 of 7 September 2012) may be cut, destroyed or disturbed without a license issued by the Department of Agriculture, Forestry and Fisheries (DAFF). These may include *Acacia erioloba* (Camel Thorn); *Boscia albitrunca* (Shepherd's Tree) and *Euclea pseudebenus* (Ebony Tree). In addition, no protected plants as scheduled in terms of the Northern Cape Nature Conservation Act (9 of 2009), also including e.g. *Boscia albitrunca, Aloe* sp. etc*,* may be destroyed/relocated without a Flora Permit issued by the provincial Department of Environment and Nature Conservation (DENC).
- Some plant species, notably *Aloe sp*. transplant well and can be relocated to areas identified by the ECO outside of the construction footprint/in rehabilitation areas - however if these are listed protected species a permit will similarly be required to undertake the translocation.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications. The Contractor's H&S Officer shall in particular ensure that there is adequate access control to potentially dangerous work areas by staff/visitors.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- A consulting archaeological/paleontological professional shall be contracted with regards to the recovery of any heritage material impacted by the construction works and undertaking the related reporting to the authorities.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies for failure to have adequate protection fencing/pegging in place.
- A penalty of up to R20 000 per incident applies for the damage of a retained sensitive feature e.g. vegetation or discovered heritage feature depending on its value/significance.
- Alternatively the cost of repair will apply for damage of a protected feature, where this can be rehabilitated. Such rehabilitation in-lieu of penalty shall be motivated specifically as a method statement and must include cost to undertake the work.

EMP SECT 4.13	5. HOUSEKEEPING AND WASTE MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Environmental Management: Waste Act (No. 59 of 2008)
- National Water Act (No. 36 of 1998) (protection of water resources)
- Occupational Health and Safety Act (No 85 of 1993) - Hazardous Chemical Substances Regulations

2. Background

- Solid waste produced during the construction phase is mainly expected to be cleared vegetation, concrete rubble, construction material off cuts or damaged components and packaging. Waste water is also expected, namely grey and foul water (from construction camp) and small quantities of contaminated water (e.g. with cement, oils or other chemicals).

3. Objectives

- Promote waste minimisation and recycling of waste generated on the Site.
- Avoid litter and pollution.

4. Performance Indicators

- No litter/dumping visible anywhere on the Site.
- Good housekeeping - neat stacking and storage.
- No evidence of contaminated waste water entering an unapproved soak-away area.
- Responsible disposal of wastes and employment of waste reduction, recycling and re use opportunities wherever possible.

5. Procedures

A. General Housekeeping

- The contractor is to keep all working areas and the site in general in a neat and tidy condition at all times, including neat and safe stacking and storage of materials and equipment, and management of waste materials at appropriate intervals. Refer also to Section 25 (“Housekeeping on Construction Sites”) of the Construction Regulations (18 July 2003) of the Occupational Health and Safety Act.

B. Refuse Control

- The Contractor shall provide labourers to clean up refuse in the Contractor's camp and working areas daily.
- Litter and waste materials (excluding rubble) shall be disposed of into bins. Bins shall be provided at all eating areas. The separation and recovery of recyclable materials is required.
- The Contractor shall provide sufficient bins with lids on Site to store the waste produced on a daily basis. Bins shall not be allowed to become overfull and shall be emptied a minimum of once weekly.
- The Contractor shall ensure that waste litter is not deposited by employees anywhere on the site except in refuse bins.

- The waste may be temporarily stored on Site in a central fenced waste area e.g. with ready fence panels or a waste skip with a shade cloth/netting roof cover where there is a risk of wind dispersal of litter across the site. The Contractor shall then remove the refuse collected on site at least once a month. Refuse must be disposed of at a licensed landfill site or accepted by a reputable recycling/recovery company.

C. Hazardous Waste

- Petroleum, chemical, harmful and hazardous waste is to be temporarily stored in a sealed drum dedicated to this purpose in the site camp. This waste shall be disposed of at a licensed hazardous waste disposal site or received by a waste contractor licensed to handle and dispose of such waste. The Contractor shall submit copies of receipts from such waste disposal sites/contractors to the Principal Agent, ESM and ECO as proof of proper disposal. Storage and disposal etc is also controlled through other relevant legislation, which must be complied with e.g. Hazardous Substances Act (No. 15 of 1973) and Occupational Health & Safety Act.

D. Builders rubble

- The Contractor shall provide labourers to clean up the Contractor's camp and working areas of rubble generated in the course of construction work at least once a week.
- Clean* rubble shall be temporarily stockpiled in a waste skip or a central stockpile/s and may be crushed on site for use as a base course material or removed from site to a crusher plant or licensed landfill site (least preferable option).

*No plastics, shrink-wrap, paint buckets or any other debris that does not constitute clean building rubble, shall be stored at such stockpile sites.

E. Recycling

- Wherever possible and practical, waste materials generated by construction shall be recycled. This includes the following:
  - Paper / cardboard (e.g. office, component packaging)
  - Metals
  - Glass
  - Plastic
  - Clean rubble (for crushing as a base course material)

- Recyclable materials shall be kept separate to general waste. This aspect must be explained to the site staff during environmental awareness training sessions.
- Separate bins/skips can be provided for on-site sorting into the above categories or if this proves difficult to manage, mixed recyclables can be sent to a reputable recycling contractor for sorting.

F. Waste water

- The Contractor shall prevent discharge of any waste water containing pollutants, such as cements, lime, chemicals and oils and fuels into any adjacent natural area.
- Wash areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. A Method Statement shall be required for all wash areas where hydrocarbon, hazardous materials and pollutants are expected to be used. This includes, but is not limited to concrete mixer cleaning.
- Disposal of sewage, grey and wash water to Local Authority facilities to be confirmed in writing by the Local Authority.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies to any party causing significant dumping of waste/littering on the Site or creation of a health nuisance through inadequate storage/periodic removal, in addition to covering the costs of its removal.
- A penalty of R 500 - R2000/day applies for failure to separate recyclable versus general waste per the requirements of the contractors Waste Management Plan.
- A penalty of R 2000 - R10 000 applies for failure to be able to produce a safe disposal certificate for hazardous waste disposed of.

EMP SECT 4.13	6. CONCRETE AND CEMENT WORKS		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Environmental Management Act (No 107 of 1998)

2. Background

- Cement powder has a high pH. Spillage of dry cement powder and concrete slurry has the potential to affect both soil and water pH adversely and may impact the growth of certain plant species.
- Careless handling of cement products resulting in spills or contaminated runoff may thus have detrimental effects on the surrounding environment e.g. vegetation and environments receiving contaminated stormwater.

3. Objectives

- Prevent contamination of the soil in future vegetation rehabilitation areas and contamination of storm water run-off from the Site.
- Prevent visual impacts caused by concrete spillage in no target areas.

4. Performance Indicators

- No evidence of spilled waste concrete or cement contaminated effluent anywhere on or off site as a result of the contractor's activities.

5. Procedures

- Cement is to be stored in a secure weatherproof location to avoid contamination of the environment.
- Concrete batching is to be avoided in no-go areas and areas that will remain vegetated. Future building/road footprint areas are preferable batching locations.
- Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment: Mortar boards and mixing trays must be used at all significant mixing and supply points (outside of casting areas) to prevent costly wastage of the materials, contamination of soils and increased cleaning requirements and all runoff from batching areas shall be strictly controlled and kept localised per an approved method statement.
- Concrete waste and wash water from concrete mixers shall be directed to an impermeable sump e.g. plastic lined pit created on site for this purpose and removed at the end of the construction contract.
- All visible remains of excess concrete shall be physically removed for disposal on completion of the concrete pour section and disposed of. All excess aggregate shall also be removed.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R5000/incident applies for avoidable concrete spillage on site causing pollution (soil or water).
- The cost of remediation will apply for pollution or damage incidents related to poor concrete handling, where this can be feasibly remediated.

EMP SECT 4.13	7. WATER USE		
Version no	01	***Date***	December 2013

1. Legislated requirements

- National Water Act (No 36 of 1998): Section 3(3), 77, 22(2)c

2. Background

- Existing boreholes on site are not a reliable water source and as such a new water pipeline will be constructed to the site for staff, construction and re-vegetation use. Water may need to be brought to site in containers or a tanker until such time as this water pipeline is operational.

3. Objectives

- Use water in a responsible way on the site to minimize consumption and prevent wastage of this limited resource.
- Prevent unauthorised water abstraction e.g. via unmetered/unauthorised boreholes.

4. Performance Indicators

- No undue water wastage observed.
- No visible water leaks.
- No new unauthorised boreholes/water use observed on site.

5. Procedures

A. Abstraction

- Boreholes must be metered and abstraction volumes monitored. If more than 10 000l is extracted on any given day, the borehole is required to be registered with the Department of Water Affairs (the existing borehole on site is registered with DWA).
- Water may not be obtained from a water course without authorisation from the Department of Water Affairs.

B. Wastage

- Wastage of water shall be avoided at all times. Only proper hoses and fittings in good repair shall be used on site. Wherever possible, pistol grip fittings should be used on the end of hoses. All taps/valves shall remain properly closed when not in immediate use and all broken pipes / fittings shall be isolated immediately and repaired as soon as possible.

C. Prevention of Water Pollution

- The pollution of surface or ground water shall be prevented. Such pollution could result from the release, accidental or otherwise, of chemicals, oils, fuels, sewage, water from excavations, construction water, water carrying soil particles or waste products etc.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies for failure to repair leaks and avoid wastage of water.
- A penalty of R 500 - R5000/incident applies for causing avoidable ground water pollution.
- The ECO may report unregistered boreholes to DWA if these exceed the daily abstraction limit.

EMP SECT 4.13	8. STORMWATER MANAGEMENT AND EROSION CONTROL		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Water Act (No 36 of 1998) General Authorisation section 3.7

2. Background

- Rainwater on site can cause erosion if its flow concentrated. Excavations can collect rainwater and cause ponding; such excavation water is susceptible to contamination. Runoff water may similarly be contaminated and cause pollution of receiving environments.
- Disturbance of drainage lines on site could de-stabilise them and make them susceptible to erosion during significant rain events.

3. Objectives

- Prevent contamination of storm water run-off from the Site to prevent pollution of the receiving environments.
- Prevent/repair erosion.

4. Performance Indicators

- No indication of erosion damage on the Site exacerbated due to construction activities.
- No evidence of contaminated stormwater.

5. Procedures

- The Contractor shall implement measures necessary to prevent the surface water from being concentrated in streams and from scouring slopes in work areas or stockpiles e.g. temporary drainage.
- Watercourse crossings shall be limited in number to the absolute minimum necessary and demarcated and no others crossing points shall be used. The soil crust and vegetation cover shall not be disturbed in any significant water courses.
- Fuel and oil spills anywhere on site are to be treated immediately with an appropriate mop-up or bio-remedial products as directed by manufacturers to prevent contamination of stormwater runoff.
- No cement, concrete, mortar, plaster etc. wastes or washings are to be disposed of anywhere on the Site other than approved temporary waste storage sites.
- No paints, paint wash water or any other chemicals shall be disposed of anywhere except at a licensed landfill site and must not be allowed to contaminate stormwater runoff.
- Any runnels or erosion channels developed on work sites during the construction period shall be backfilled and compacted, and the areas restored to a proper condition.
- Stabilisation measures may include.
    - ✓ The packing of sandbags, straw bales or brush to reduce the speed of water flow where water is scouring the topsoil and results in the formation of erosion gullies.
    - ✓ The installation of water cut-off and flow channels.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.

- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- The cost of remediation will apply in the case of environmental damage caused through failure to implement these specifications.

EMP SECT 4.13	9. DUST CONTROL		
Version no	01	***Date***	March 2012

1. Legislated requirements

- NEM: Air Quality Act (No. 39 of 2004) (Dust)

2. Background

- Disturbance of the vegetation cover and soil crust increases wind erosion and related dust risks from such areas. The vegetation of the area, once disturbed, is slow to recover/re-establish.
- Vehicle traffic can lead to dust generation from unconsolidated surfaces on site.
- Dust is a nuisance to staff and excessive dust poses a potential health risk. Settled dust also reduces the efficiency of the solar panels once these have become operational.
- As roads and neighbouring residents are relatively far from the work site and the footprint disturbance is small in relation to the greater site, it is unlikely that adjacent land users will be affected by dust generated from the site.

3. Objectives

- Avoid/minimize wind-blown sand/dust problems and associated nuisance.

4. Performance Indicators

- No evidence of significant wind-blown sand/dust problems.

5. Procedures

- Vegetation clearing and soil crust disturbance must be kept to the absolute minimum required to develop the project.
- The Contractor shall take appropriate measures to minimise the generation of dust as a result of construction works, operations and activities to the satisfaction of the ESM, ECO and the Principal Agent.
- Potentially erosive stockpiles shall be located in wind sheltered areas wherever possible or stabilised appropriately. The use of potable water for dust suppression on stockpiles must be avoided.
- Vehicle speeds shall not exceed 20km/h when traversing unconsolidated areas on site. Unpaved road/track surfaces may be sprayed with water/Dustex to suppress dust during construction activities.
- Excavation, handling and transport of erodible materials shall be avoided under high wind conditions (excess of 45km/hr) when a visible dust plume is present.
- Exposed unconsolidated surfaces shall be surfaced, re-vegetated or stabilised as soon as it is practically possible. Stabilisation measures may include but are not limited to:

    - ✓ surfacing/compacting,
    - ✓ seeding/planting,
    - ✓ brush packing,
    - ✓ application of Dustex or similar soil binder.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.

- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies for failure to implement adequate dust control.

EMP SECT 4.13	10. MATERIALS TRANSPORT AND STORAGE		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Environmental Management Act (No 107 of 1998)

2. Background

- All the components of the panels, transmission lines, buildings and related infrastructure would be imported and transported to the selected area by road. Construction traffic will access the site off the R359.

3. Objectives

- To promote safety of workers and adjacent public road users.
- To keep public roads clear of debris and lost materials.

4. Performance Indicators

- Storage method and location of materials does not result in environmental pollution or other negative impact.
- No evidence of alien invasive plant seedlings on site growing from imported stockpiled materials e.g. imported sand.
- No evidence of materials falling or having fallen from the contractor's/suppliers' vehicles.
- Roads shall be clear of mud, sand or other debris.
- Access routes and points are in approved locations and kept maintained (passable and stabilised against undue dust generation and free of debris).

5. Procedures

- No materials shall be stored in “no-go” areas. Material stockpiles (e.g. topsoil, sand and stone) must be protected against undue wind and water erosion (for prevention of dust and loss of material resources).
- Care must be taken to limit the unintentional importation of alien invasive plant seeds to site with the building material or on the transport used.
- The Contractor shall ensure that access points and roads / routes on the site for plant / vehicles are approved and maintained in a serviceable condition to the satisfaction of the ESM, ECO and Principal Agent.
- The Contractor is to ensure that all vehicles are in a road-worthy condition. No loose materials may be transported on public roads without the load being secured under a tarpaulin or similar, in order to prevent possible danger to other road users from materials falling from the back of vehicles.
- Any materials, which have in fact fallen from a vehicle despite precautions, must be cleared from the road by the Contractor immediately and removed (as opposed to just leaving them on the side of the road).
- Traffic nuisance/safety issues at the R359 access point shall be avoided.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/day applies for failure to keep roads clean and in good condition.
- The cost of remediation will apply in the case of environmental damage caused through failure to implement these specifications.

EMP SECT 4.13	11. HAZARDOUS MATERIAL HANDLING AND STORAGE		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Hazardous Substances Act (No. 15 of 1973) and Hazardous Chemical Substances Regulations (August 1995)

2. Background

- Hazardous substance refers to a substance scheduled in the Hazardous Substances Act (No. 15 of 1973) and Hazardous Chemical Substances Regulations (August 1995). These include fuels, oils, solvents, cement, pesticides, asbestos etc.

3. Objectives

- To ensure safe and proper storage, handling and disposal of hazardous substances on the Site so as to avoid environmental pollution and human health risks.

4. Performance Indicators

- No pollution incidents reported or observed on the Site.
- Safe disposal certificates and relevant MSDS on the Contractor's site file.

5. Procedures

- Hazardous substances, as scheduled by the Hazardous Substances Act (No. 15 of 1973), such as cement, diesel, oils etc., must be stored, handled and disposed of in such a way that they prevented from affecting non target areas of the natural environment including dispersion by wind or water.
- Material Safety Data Sheets (MSDS) for all hazardous materials used on site shall be available on the Contractor's environmental file for reference e.g. in first aid cases, to guide personal protective equipment use, to guide storage, spill clean ups etc.
- No hazardous substances may be disposed of on the Site. These shall be directed to a hazardous waste disposal site or collected by a waste contractor licensed to handle and dispose of such waste materials.
- No hazardous paint products and chemical additives and cleaners such as thinners and turpentine may be disposed of on Site. Brush / roller wash facilities shall be established to the satisfaction of the Principal Agent and hazardous disposal receipts shall be kept on file at the site office. A Method Statement, approved by the Principal Agent, ESM and ECO will be required.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 3 Fuel/Flammables Storage and Handling** and **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R5000/incident applies for pollution to the environment caused by improper hazardous substances storage and handling.
- A penalty of R 2000 - R10 000 shall apply for failure to produce the required safe disposal certificates for hazardous waste removed from the site.
- The cost of remediation will apply in the case of environmental damage caused through failure to implement these specifications.

EMP SECT 4.13	12. VEGETATION MANAGEMENT REQUIREMENTS		
Version no	001	***Date***	December 2013

1. Legislated requirements

- National Environmental Management Act (No 107 of 1998)
- National Environmental Management Biodiversity Act (No 10 of 2004)
- Northern Cape Nature Conservation Act (2009)

2. Background

- Re-vegetation of areas disturbed by construction in this environment is not an easy process, particularly if the soil crust/topsoil layer is disturbed. It takes considerable time (if at all) to rehabilitate the vegetation matrix to the original in disturbed areas and as such the principal aim is to limit the amount of vegetation/soil crust disturbed and employ assisted re-vegetation only in those areas where disturbance could not be avoided.

3. Objectives

- Revegetation of areas disturbed by construction where feasible to stabilise the site, improve aesthetics and provide improved habitat on decommissioning.
- Avoid ecological damage through misuse of pesticides and fertilizers.
- Maintain soil stability.

4. Performance Indicators

- Disturbed areas are re-vegetated after construction is complete where this is required and are establishing well.
- No damage/pollution to the environment (e.g. indiscriminate use of pesticides) observed.

5. Procedures

A. General

- Prior to re-vegetation of any portion of the Site, the Contractor shall remove all remnants of construction materials from those areas and ensure that topsoil has been reinstated and that the planting area soil is un-compacted.

B. Fertilisation

- Should fertilisation be required during establishment, only organic fertilizers may be used.
- Fertilizer shall be applied at rates not exceeding those prescribed by the manufacturer.

C. Use of Pesticides

- The use of pesticides on this site is to be avoided.

D. Plant species

- Any re-vegetation planning shall be endorsed by a professional botanist that has experience with the veld type on site (Blouputs Karroid Thornveld).
- Natural re-vegetation (from the existing seed bank) is favoured above assisted re-vegetation through the introduction of foreign seed or seedlings which may become invasive.
- No species listed under the National Conservation of Agricultural Resources Act (Act 43 of 1983) or any amendments thereto may be introduced to or be allowed to establish on the site.

E. Mulching

- Install a mulch layer (e.g. wood chip) or use brush packing in areas where soils need protection from wind erosion in disturbed sites or in areas shaded out by the panels.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R2000/incident applies for ecological damage/pollution caused by poor management of fertilizers or pesticides on site.
- The cost of remediation will apply in the case of environmental damage caused through failure to implement these specifications.

EMP SECT 4.13	13. ANIMALS ON SITE		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Environmental Management Biodiversity Act (No 10 of 2004)
- Northern Cape Nature Conservation Act (2009)

2. Background

- Due to the proximity of natural veld, wild animals may be encountered on site.

3. Objectives

- Protect wild animals on the Site by relocating them if required.
- Prevent interference with stock that may be grazing adjacent to the site.

4. Performance Indicators

- No evidence of unduly disturbed or injured wildlife or domestic livestock.

5. Procedures

- If wild animals are encountered on the Site, they may not be trapped, captured, disturbed, injured or killed.
- If not threatened, or causing a threat to anyone, the animal is to be left alone.
- If threatened e.g. trapped in an excavation, or causing a threat e.g. a potentially venomous snake, the ESM is to be contacted to advise on the safe capture of the animal and release thereof into another similar natural area of the farm. Where required assistance/input from local conservation staff may be required. No untrained person shall attempt to capture a potentially venomous snake.
- Install effective visibility markers, namely bird “flappers” (diverters) on the entire length of any power lines installed by the solar energy facility development. This should be done in close collaboration with the power management authority. The site and transmission line route should be monitored by the Contractor and ESM during construction to determine avian mortalities.
- No staff from the development site shall interfere with livestock in adjacent areas in any way at any time. No gates that were found closed shall be left open. This shall be clearly conveyed in the environmental awareness training course presented to all staff on site.

6. Monitoring and Reporting

- The Contractor is to report any incidences of injured animals to the ESM.
- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R500 - 10 000 per incident applies to malicious or negligent harm to a wild animal or domestic livestock encountered on site.

EMP SECT 4.13	14. NOISE, NUISANCE AND LIGHTING CONTROL		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993)
- National Environmental Conservation Act (1989) Section 25 (noise regulations)

2. Background

- The Contractor is warned that the work site is in an area known for its dark, starry night skies and thus light pollution must be kept to a minimum.

3. Objectives

- Prevent excessive lighting from creating a nuisance to surrounding land-users/ animal communities.
- Prevent excessive noise from creating a health risk to site staff.

4. Performance Indicators

- No records/complaints of excessive lighting creating a nuisance to surrounding members of the public.
- No records/complaints of excessive noise causing discomfort to staff.

5. Procedures

- Appropriate directional and intensity settings are to be maintained on all hooters and sirens. In addition, vehicles' exhaust system silencers shall be correctly maintained.
- Hearing protection shall be issued to staff in work areas where noise levels exceed 85dB or as otherwise specified in the contractor's Health and Safety Plan.
- No permanent external flood lighting shall be installed by the contractor. Necessary security lighting may be activated by motion sensors only.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The Contractor's Health and Safety Agent shall monitor noise related staff safety issues on an average monthly basis.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring and reporting regarding compliance with these specifications.

- The Contractor's Health and Safety Agent shall be responsible for external monitoring and reporting regarding compliance with noise related staff safety issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 200 - R1000/day applies for failure to adhere to the CEMP lighting limitations and in so doing causing significant disturbance to neighbouring land users. At least one written complaint is required to substantiate this.

EMP SECT 4.13	15. FIRE MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Veld and Forest Fire Act (No. 101 of 1998) (fire prevention/control)

2. Background

- The veld typeon site is not prone to veld fires but stored flammables and combustible materials brought to site, plant operating on site and informal open fires made by staff outside of designated locations could give rise to uncontrolled fires.

3. Objectives

- Maintain the Site so as to reduce the risk of fire.
- Minimize air pollution (through unauthorised burning of wastes etc).

4. Performance Indicators

- No fires in unauthorized locations (e.g. outside of site camp).
- No unauthorised burning of wastes on site.
- Fire fighting equipment available, accessible and serviceable.

5. Procedures

A. Fire Prevention

- The Contractor shall take all reasonable and active steps to avoid increasing the risk of fire through their activities on Site.
- The Contractor shall ensure that the basic fire-fighting equipment is available on site. The Contractor shall supply the Site with tested and approved fire fighting equipment (minimum 2 X 9kg fire extinguishers). All "hot" work areas (e.g. welding, gas cutting or cutting of metal) must have fire extinguishers readily at hand.
- Fires for heating or cooking, e.g. a braai facility, shall only be permitted at a designated site at the site camp approved at the discretion of the Principal Agent and shall be away from any flammable stores or combustible materials. Such fires shall be supervised at all times; a fire extinguisher shall be at hand as well as sufficient water to completely douse the fire after use.
- The disposal of waste material by burning is prohibited unless specifically approved by the Principal Agent.
- The Contractor shall be liable for all costs incurred by organisations sub-contracted to extinguish all fires started by any person(s) under their control. The Contractor shall be liable for all costs incurred to remediate burnt areas.

B. Fire Response

- All staff is to be familiar with the position of fire control equipment on site and response and evacuation procedures. This should be covered in the Contractor's H&S inductions for all new site staff.

- In the case of a fire occurring on site, the following actions are to be taken immediately:

    - ✓ Contact Local Fire Department/farm response unit.
    - ✓ Warn neighbours of potential danger.
    - ✓ Take whatever practical measures are required to bring the fire under control, prior to the fire department arriving on site, without prejudicing the safety of any of the staff.

6. Monitoring and Reporting

- The Contractor's H&S Officer shall ensure that all inductions and training is carried out to facilitate fire response and shall ensure that all fire fighting equipment is available and inspection registers are up to date.
- The ESM shall monitor minimum weekly that no unauthorised fires are being made and of undue fire risks observed and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 16 Emergency Response and Specification 20 Enforcement** of this CEMP.

9. Breach

- The cost of fire fighting and remediation may apply in the case of environmental damage caused through a fire caused by failure to implement these specifications.

EMP SECT 4.13	16. EMERGENCY MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993) and its Construction Regulations (July 2003).

2. Background

- Emergency situations on site may result in significant environmental damage e.g. chemical spills and fires, if not addressed quickly.

3. Objectives

- To facilitate efficient response to emergency situations that may arise on the Site.

4. Performance Indicators

- Contractor emergency procedure in place and up to date.
- Hydrocarbon/chemical spill response products are on site.

5. Procedures

A. General

- The emergency procedure including telephone numbers of emergency services, including the local fire fighting service and the farmer, police and ambulance as well as contact details for contractor site management shall be posted noticeably at the Site office.
- The Contractor's safety officer is to present emergency procedures during the mandatory Health and Safety Induction presented to all new site staff.

B. Fire

- The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

C. Chemical/fuel Spill

- The site shall have a supply of absorbent material readily available to absorb any emergency hydrocarbon (fuel/oil) spills, and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to absorb / deal with a minimum of 200 litres of hydrocarbon liquid spill.
- There are a number of products on the market, which are designed and suitable as absorbents and encapsulators of hydrocarbons (refer to **Appendix 5** of this CEMP for contact details of some of the possible suppliers).
- Treatment and remediation of spill areas shall be undertaken to the satisfaction of the Principal Agent, ESM and ECO.

- In the case of a potentially hazardous chemical spill (hydrocarbon based or otherwise):
    - The Principal Agent and ESM shall be contacted and shall further ensure that,
    - The source of the spillage shall be isolated.
    - The spillage shall be contained using sand berms, sandbags, pre-made booms, and sawdust or other absorbent materials.
    - Cordon off and ensure safety of the spillage area.
    - A specialist cleanup/remediation service provider shall be contracted if required.
    - Mop up/remediate the spillage site.

6. Monitoring and Reporting

- The Contractor shall monitor the site daily with respect to compliance with the specifications.
- The ESM shall monitor minimum weekly that the specifications are complied with and provide the Contractor and Principal Agent with an inspection report of any specifications not adequately complied with and how to rectify this.
- The ECO shall provide periodic summary reports of compliance to the project team and DEA.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for regular monitoring of compliance with these specifications and communications with the contractor to rectify any non compliance issues.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.
- The ECO is responsible for external compliance monitoring, penalty recommendations to the Principal Agent and reporting to the environmental authorities.

8. Related Documents

- Refer to **Specification 25** and **Specification 20 Enforcement** of this CEMP.

9. Breach

- The cost of remediation will apply in the case of environmental damage caused through failure to implement these specifications.

EMP SECT 4.13	17. SAFETY AND SECURITY		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993) and its Construction Regulations (July 2003).

2. Background

3. Objectives

- To facilitate safety of staff and visitors on/adjacent to the Site.
- Sensitive use of security lighting and fencing.

4. Performance Indicators

- Access control in place and efficient.

5. Procedures

A. Safety

- The safety of the visitors and site staff during the works is of paramount importance. The work site is to be secured and access to the work sites by unauthorised persons is to be prevented by the Contractor, as far as is reasonably practical.
- The Contractor has to ensure traffic safety at all times and has to implement safety measures for this purpose.
- The Developer and Contractor are to take cognisance of the requirements of the Occupational Health and Safety Act No. 85 of 1993 and its relevant regulations, in particular the Construction Regulations dated July 2003.

B. Security

- With the possible exception of any security staff that may be required to stay overnight, no personnel will be permitted to live on site. Security staff must be provided with heating and cooking facilities (in order that they do not need to light fires), access to toilet facilities and communication equipment.
- Any security lighting provided by the Contractor is not to cause light pollution (refer to CEMP section 4.14.14 for requirements).

6. Monitoring and Reporting

- The Contractor's H&S officer shall monitor the site regularly with respect to compliance with the specifications. This shall be verified by the Contractor's external H&S Agent's monthly report.
- The ESM shall report to the Contractor's H&S Officer any safety concerns that were observed during his/her site inspections.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.

- The contractor's H&S Agent shall be responsible for external monitoring and reporting regarding compliance with these specifications (minimum monthly).
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.

8. Related Documents

- Client's H&S specification and Contractor's H&S Plan.
- CEMP sections **4.14.13** and **4.14.14**.

9. Breach

- Nil (to be addressed under H&S management on site).

EMP SECT 4.13	18. TEMPORARY SITE CLOSURE		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993) and its Construction Regulations (July 2003).

2. Background

- Most building sites close over builder's holiday's in December. Other factors may also lead to temporary closure e.g. phasing of the work.

3. Objectives

- To ensure that the Site is left in a safe, clean and stable condition at times when there is no management control for longer than a fortnight.

4. Performance Indicators

- Temporary closure reports submitted by ESM and Contractor's H&S Officer confirming all requirements are met.

5. Procedures

- If the Site is closed for a period exceeding a fortnight, a checklist procedure shall be carried out by the Contractor in consultation with the ESM.
- The Contractor's Safety Officer (in terms of the Occupational Health and Safety Act) is to check the site and report to the Principal Agent and ESM regarding the following:

  - Ensure fuel stores are as low in volume as possible, no leaks;
  - Fire extinguishers serviced and accessible;
  - Emergency and Management telephone numbers to be available and displayed;
  - All trenches/excavations closed and secured;
  - Fencing and barriers in place;
  - Security persons briefed and have facility for contact;
  - Fire hazards identified and minimized;
  - Material stockpiles secured;
  - Structures vulnerable to high winds secure.

- The ESM is to check and report to the Principal Agent:

  - Dust mitigation in place as applicable;
  - Slopes and stockpiles stabilized;
  - Fuels / hazardous substances stores secured and cleaned;
  - Materials stores secured;
  - Portable toilets empty and secured;
  - Refuse bins empty and secured and wastes removed from site;
  - Drip trays empty & secure.

- The Contractor is to ensure that all temporary closure requirements are met before leaving the site.

6. Monitoring and Reporting

- The Contractor's H&S Officer and ESM shall inspect the site prior to closure and complete the checklists required. Both shall provide written confirmation to the Principal Agent in this regard. The ESM shall provide written confirmation of the environmental issues to the ECO.

7. Responsibilities

- The Contractor shall ensure compliance with these specifications.
- The ESM shall be responsible for reporting regarding compliance with these specifications.
- The Principal Agent shall issue site instructions to the Contractor where required to address outstanding temporary closure issues.

8. Related Documents

- Refer to **Specification 20 Enforcement** of this CEMP.

9. Breach

- A penalty of R 500 - R5000/day applies for failure to address temporary closure requirements adequately, thus causing avoidable environmental management problems on site whilst the Contractor is off Site.

EMP SECT 4.13	19. SITE CLEANUP AND REHABILITATION		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Environmental Management Act (No 107 of 1998) S28

2. Background

- Before environmental closure can be granted for the construction phase of the project, all excess materials, construction wastes and temporary infrastructure used during the construction phase must be removed from site and all agreed rehabilitation interventions undertaken.
- This includes any trench areas for the water pipeline and the areas disturbed by the installation of the pylons.
- The exact nature of the visual impact of the facility on the Augrabies National Park after construction is uncertain. Thus while the facility is not anticipated to have a significant visual impact viewed from the Park and it is anticipated that existing vegetation between the Park and the facility will be adequate to break the sight lines, an allowance is made to reassess this once construction is complete and undertake planting of tree groups to assist with mitigation if required.

3. Objectives

- Leave the site in a sound, neat, tidy and stable condition after construction works have been completed.
- Further mitigate visual impact from the Augrabies National Park if required through selective planting of tree groups on farm Rooipad 9/15.

4. Performance Indicators

- No evidence of remaining construction wastes or excess materials on Site.
- No evidence of unrepaired damages caused by the Contractor's activities on Site.
- All required landscape rehabilitation undertaken.
- All outstanding environmental penalties paid by the Contractor.
- Tree groups for visual impact mitigation planted on Farm Rooipad 9/15 if deemed necessary.

5. Procedures

- The Contractor shall ensure that all temporary structures, equipment, materials, waste and facilities used for construction purposes and not part of the permanent works is removed upon completion of the project. The site cleanup shall be to the satisfaction of the Principal Agent, the ESM and the external ECO.
- The Contractor shall be responsible for rehabilitating/repairing areas damaged by construction activities related to the project and not required as part of the permanent works as identified by the ESM, ECO and the Principal Agent, as soon as possible. The Contractor's procedure for rehabilitation shall be approved by the ECO and the Principal Agent and where it involves re-vegetation, by the consulting botanist/revegetation specialist.

- Assisted screening of the facility may be required through the planting of groups of suitable trees, on the Rooipad 9/15 farm to mitigate sight lines from the Augrabies National Park towards the facility, although it is thought that the existing vegetation should be adequate for this purpose. This need shall be assessed at the end of the construction phase through discussion between the Developer, Park Manager and the ECO. The cost of the planting of up to 50 trees of minimum height at planting from ground level of 1.2 meters (if commercially available, otherwise closest size available) and irrigation during 12 months of establishment per the requirements of OEMP section 5.9.6 (5C) shall be allowed for by the Developer in case of this requirement. More/larger trees can be planted at the Developer's discretion. Should the need for additional screening be confirmed then the trees are to be sited to mitigate specific site lines that have been identified and the locations (GPS co-ordinates) be agreed in writing between the Developer, Park Manager and ECO.
  The aim of these measures must be to break the perceived scale of the facility rather than to hide it. The local thorn trees (*Acacia mellifera* subsp. *detinens*) are to be preferred tree species as most other species will be taller than the local vegetation and will therefore draw attention to the site/facility. However, this species is very slow growing and plants would have to be grown from seed since they would not transplant well. A botanist with knowledge of local plant species and conditions shall advise on any alternative species considered. The planting of tree lines should be avoided as this could result in a higher visual impact than that of the facility itself.

6. Monitoring and Reporting

- The ESM shall undertake an environmental closure inspection after the contractor has confirmed that works have been completed and provide the Contractor, Principal Agent and ECO with an inspection report of closure requirements not adequately complied with.
- The external ECO shall provide a final environmental closure report to the project team and DEA after all outstanding issues have been addressed.

7. Responsibilities

- The Contractor shall ensure that all closure requirements are complied with.
- The external EC shall be responsible for independent monitoring and reporting regarding compliance with these specifications.
- The Principal Agent shall issue site instructions to the Contractor where required to address non compliance with the specifications.

8. Related Documents

- nil.

9. Breach

- Failure to complete closure requirements will result in no environmental closure report being issued to the authorities by the ECO.

EMP SECT 4.13	20. ENFORCEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- The conditions of authorisation for this development in terms of the National Environmental Management Act (No. 107 of 1998).

2. Objectives

- To provide methods of enforcement to ensure that the provisions of this CEMP are implemented and to provide recourse for environmental damage.

3. Performance Indicators

- Penalty issue log kept by the Principal Agent.
- Proof of payment of penalties by the Contractor.

4. Procedures

- Where the Contractor inflicts damage upon the environment or fails to comply with any of the environmental specifications contained within this CEMP, he may be liable to pay a penalty for breach of the conditions of the environmental specifications which form part of the works contract.
- The Contractor is deemed NOT to have complied with this Specification if:
  - within the boundaries of the site, site extensions and haul / access roads there is evidence of contravention of the Specification;
  - environmental damage ensues due to negligence;
  - the Contractor fails to comply with corrective or other instructions issued by the Principal Agent within a specific time;
  - the Contractor fails to respond adequately to complaints from the public/farm management.
- Penalties shall be issued per incident for the Contractor's responsibility at the discretion of the Principal Agent in consultation with the ECO.
- The Principal Agent shall inform the Contractor of the contravention and the amount of the penalty, and will deduct the amount from monies due under the Contract.
- Payment of any penalties in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law.
- The penalties listed under each of the specifications sections in this CEMP (not necessarily an exclusive list) shall be issued or alternatively any remedial costs incurred as a result of non-compliance with the environmental specifications and shall be imposed by the Principal Agent on the Contractor for contraventions of the environmental specifications by individuals or operators employed by the Contractor and/or his sub-contractors. Where there are ranges, the amount shall depend on the severity and extent of the damage done to the environment:
- For each subsequent similar offence committed by the same team or individual, the penalty may be doubled in value to a maximum value of R20 000.

- All monies collected through penalties shall be held by the Developer and be accounted for. A summary page is to be included with the monthly payment certificates as a record of penalties issued to date. On completion of the construction contract penalty funds shall be allocated to a suitable local environmental cause agreed upon by the Developer, Contractor, ESM, ECO and DEA case officer and payment must be confirmed prior to construction phase environmental closure being granted for the project.

5. Monitoring and Reporting

- The ESM shall monitor minimum weekly that the specifications are complied with and provide the ECO and Principal Agent with a written record of any specifications not adequately complied with.
- The ECO shall monitor significant environmental contraventions noted by the ESM as well as observations from the ECO's compliance monitoring on site and request the Principal Agent to issue the contractor with a written warning of any specifications not adequately complied with/repeat offences. Failure to rectify the non compliance within the stipulated time frames in the written warning may cause a penalty to be levied by the Principal Agent on recommendation of the ECO.
- The Principal Agent shall account for all penalties issued and present these as part of the site meeting minutes.
- The ECO shall indicate all issued penalties and proof of payment in the final environmental closure report issued to the project team and DEA.

6. Responsibilities

- The Principal Agent shall recommend penalties accordingly after a warning letter and stipulated time frame to rectify the non compliance has been issued.
- The Principal Agent shall issue penalties to the Contractor in terms of breach with the Construction Contract, shall collect monies and ensure payment to the environmental cause identified at the end of the construction contract.
- The Contractor shall ensure that any issued penalties are paid.
- The ECO shall be responsible for external monitoring and reporting regarding compliance with these specifications.

7. Related Documents

- The penalty clauses in the Construction Contract.
- Suggested penalties under each specification section.

EMP SECT 4.13	21. INCIDENT MANAGEMENT		
Version no	01	***Date***	December 2013

1. Legislated requirements

2. Background

- There is a need to investigate and document significant incidents that occur on the project site (e.g. damage to a no-go area, pollution event etc) in order to assess if current CEMP environmental management measures are adequate to address the expected risks on the project.

3. Objectives

- Allocating responsibilities and investigating the cause of significant environmental incidents/CEMP contraventions and making management adjustments were possible to prevent the reoccurrence of the incident.

4. Performance Indicators

- Detailed incident reports on the project site file.

5. Procedures

- Any significant/extraordinary incident (in which significant environmental damage has resulted) occurring on site will be reported to the ESM immediately.
- Upon receiving a report of an incident, the ESM shall take any action required to contain / isolate the adverse effects.
- Once the incident area has been stabilised, the ESM shall complete the incident investigation form (refer to template form at the end of this procedure). This shall include a full investigation into the causes of the incident and how a recurrence can be avoided.
- Once the form has been completed it shall be copied to the ECO for review.

6. Monitoring and Reporting

- As below.

7. Responsibilities

- The **ESM** is responsible for completing incident reports.
- The **ECO** is responsible for reviewing the incident reports and providing advice where necessary.

8. Related Documents

- The Incident report form that follows:

INCIDENT REPORT FORM					
Section One: To be completed by the person reporting the incident:					
Name		**Designation**			
Contact number		**Physical location of incident**			
Describe the incident					
Was there damage/ contamination of/affect on any of the following? (Tick the appropriate box)					
Soils/vegetation		**Water**		**Air**	
Artefact		**Fauna**		**Infrastructure**	
OTHER:					
What remediation has been undertaken? (describe)					
Has the damage/ contamination been completely remediated?					
If not, what residual damage remains (detail the residual damage)?					
If residual damage remains - what is the reason and what is planned with respect to the environmental damage?					
Upon investigation, what was found to be the cause of the incident? (Detail)					
Is this a repeat of a similar incident?					
What is the reason that planned changes did not prevent a recurrence of the incident?					
What is to be changed to ensure that the incident will not be repeated? (Detail)					

Section Two: To be completed by the ECO:	
Does the incident potentially compromise legislation? Do Authorities need to be informed e.g. DEA, DWA?	
What action has been taken?	
In the opinion of the ECO is the remediation action sufficient?	
If not, what further actions must be taken? (detail)	
Have all the required and appropriate actions been taken to the satisfaction the ECO?	
Have all parties signed the incident form?	

Note: In the event of a significant incident which is defined in terms of section 30(1)(a) of the National Environmental Management Act as an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed, the incident shall be reported to the National Department of Water and the Environment and an appropriate incident form completed and submitted to the regional office or as instructed by the competent official.

Other Comments:

_____ _____

Date ESM

_____ _____

Date ECO

4.14. FINANCING OF ENVIRONMENTAL CONTROL

All aspects covered in this document shall be deemed to be included in the rates tendered by the Principal Contractor in his Schedule of Quantities. Some of the important cost items have been listed below to assist the contractor in making provision for implementation of the specifications:

4.14.1. Site demarcation

The supply, installation and removal at the end of the construction of all temporary fences e.g. to secure the site, demarcate unsafe or protected "no-go" areas as per the requirements of clause 4.14.4 of this CEMP.

4.14.2. Protection of stock piles from blowing or washing away

The covering of erodible stockpiles, including any cover material that may be required.

4.14.3. Storage of fuel and oils

The supply, construction, installation, transport, upkeep and removal of all facilities required for storage and management of fuel and oils. Include the supply of a spill response product per the requirements set out in this CEMP.

4.14.4. Cement product management

The supply, construction, installation, transport, upkeep and removal of all materials and facilities required for managing cement products during storage batching and handling. Include all facilities required for managing contaminated wash/effluent water.

4.14.5. Storm water

The supply, construction, installation, transport, upkeep and removal of all facilities required for managing storm water run-off from the site.

4.14.6. Supply of drip trays for stationary and "parked" plant

The supply, installation, transport, upkeep and removal of all drip trays required.

4.14.7. Dust management

The supply, application, transport, upkeep and removal of all materials required to ensure that dust is adequately controlled e.g. Dustex after earthworks is complete, water for un-surfaced roads and cover material for stockpiles.

4.14.8. Solid waste management

The supply, application, transport, upkeep and removal of all materials required to ensure that solid waste is adequately controlled (including a recycling/re-use program).

4.14.9. Fire Control

The supply, transport, upkeep and removal of all material required for fire control e.g. fire extinguishers.

4.14.10. Staff attendance at the environmental awareness training course

Staff attendance at the environmental training course.

The sum shall cover all costs incurred by the Contractor in providing the training, venue and facilities as detailed in the Specifications and in ensuring the attendance of all relevant employees at the training.

4.14.11. Eating areas

The supply, construction, installation, transport, upkeep and removal at the end of the construction of all eating areas, structures and facilities.

4.14.12. Ablutions

The supply, maintenance, regular emptying and removal of temporary toilets.

4.15. APPENDICES

Appendices 1 – 7 of the CEMP follow:

APPENDICES

Appendix 1	*Site Layout Plan*
Appendix 2	*ESM Checklists for CEMP Compliance*
Appendix 3	*Basic Environmental Education Content*
Appendix 4	*Method Statement Template*
Appendix 5	*List of Example Hydrocarbon Spill Response Products*

Appendix: 1

Site Layout Plan

<insert latest construction plans here (at commencement of the construction phase)>

Appendix: 2

ESM Checklists for CEMP Compliance

AUGRABIES SOLAR ENERGY FACILITY CEMP: START UP CHECKLIST

ESM:

CEMP	Item	Issue/Concern	Compliance			Comments
			Y	N	Part	
4.8	**Admin**	Environmental authorization kept in file on site				
		Contracts manager on site/ foreman has copy of CEMP on site and confirms that contents is understood and will be complied with.				
4.12	**Notification of construction start**	DEA notified in writing 10 days before construction start				
4.3.3	**Env. Education**	Contract site staff env. educated				
4.3.4	**M Statements**	All required MS submitted & approved				
4.14.1	**Contractor's Camp and lay-down areas**	Setup in agreed location				
		Adequate toilets provided (1:15/1:30)				
		Adequate bins provided				
		Adequate eating area/s and drinking water provided				
		Adequate hydrocarbon spill response product on site in case of a spill				
		Provision of enough fire fighting equipments (extinguishers, etc) on site				
		Availability of all emergency contact details onsite and known to staff e.g. fire fighting, hydrocarbon spills services, police services, ambulance, etc				
4.14.4	**Restriction of Working areas**	All "no-go" area fencing in place or demarcated on site plan in site office				
		All facilities, materials inside approved working areas				
4.14.3	**Fuel storage area**	Adequate fuel storage area assigned				
4.14.13	**Animal and plant rescue**	All rescue and relocation undertaken prior to site clearing				

ESM confirms all start up requirements have been met:

ESM: _____ Signed: _____

Date: _____

AUGRABIES SOLAR ENERGY FACILITY CEMP: WEEKLY COMPLIANCE CHECKLIST ESM:

CEMP	Item	Issue/Concern	Compliance			Comments
			Y	N	Part	
4.14.1	**Site establishment**	Adequate, clean toilet facilities for site staff				
		Eating areas and safe drinking water provided for site staff				
4.14.2	**Site clearance and earthworks**	In approved areas only				
		Topsoil separated and conserved.				
		Excavations checked for possible fossil/heritage finds				
4.14.3	**Flammables storage and handling**	Adequate storage facilities including approved location, ventilation, bunding and signage				
		No spillages/spillages adequately treated				
		Required drip trays in place				
4.14.4	**Restriction of work areas**	Sensitive features, protected vegetation, safety risk areas etc termed as "no-go" areas are designated clearly by means of suitable demarcation fencing/pegging where these are close to the work sites and in danger of accidental damage /staff ingress.				
		Sensitive features remain intact and undamaged.				
		No historical artefacts/fossils found				
4.14.5	**Housekeeping and waste management**	No litter/dumping visible anywhere on the Site.				
		Good housekeeping - neat stacking and storage				
		No evidence of contaminated waste water entering an unapproved soak-away area				
		Responsible disposal of wastes and employment of waste reduction, recycling and re use opportunities wherever possible.				
4.14.6	**Concrete and cement works**	No evidence of spilled waste concrete or cement contaminated effluent anywhere on or off site as a result of the contractor's activities.				
4.14.7	**Water use**	No undue water wastage observed.				
		No visible water leaks				
		No unauthorised boreholes on site				
4.14.8	**Stormwater management and erosion control**	No indication of erosion damage on the Site exacerbated due to construction activities.				
		No evidence of contaminated stormwater				
4.14.9	**Dust control**	No evidence of significant wind-blown sand/dust problems.				
4.14.10	**Materials transport and storage**	No evidence of materials falling or having fallen from the contractor's/suppliers' vehicles.				
		Roads shall be clear of mud, sand or other debris				

CEMP	Item	Issue/Concern	Compliance			Comments
			Y	N	Part	
		Access routes and points are in approved locations and kept maintained (passable and stabilised against undue dust generation and free of debris)				
		Only approved crossings used over significant drainage lines				
4.14.11	**Hazardous material handling and storage**	No pollution incidents reported or observed on the Site.				
		Safe disposal certificates and relevant MSDS on the Contractor's site file.				
4.14.12	**Vegetation management**	Disturbed areas are re-vegetated after construction is complete where this is required and are establishing well.				
		No damage/pollution to the environment (e.g. indiscriminate use of pesticides) observed.				
4.14.13	**Animals**	No evidence of unduly disturbed or injured wildlife or domestic livestock.				
		Any animals that needed relocation?				
4.14.14	**Noise, nuisance and lighting control**	No records/complaints of excessive lighting creating a nuisance to surrounding members of the public.				
		No records/complaints of excessive noise causing discomfort to staff				
4.14.15	**Fire management**	No fires in unauthorized locations (e.g. outside of site camp).				
		No unauthorised burning of wastes on site.				
		Fire fighting equipment available, accessible and serviceable.				
		Fire response plan available.				
4.14.16	**Emergency management**	Contractor emergency management plans in place and up to date.				
		Hydrocarbon/chemical spill response products are on site.				
4.14.17	**Safety and security**	Any H&S issues noted for attention of safety officer?				

Requirements to rectify non compliances and target dates:

ESM: _____ Signed: _____

Date: _____

AUGRABIES SOLAR ENERGY FACILITY: SITE CLOSURE CHECKLIST

ESM:

Item	Issue/Concern	Compliance			Comments
		Y	N	Part	
Admin	Environmental authorization complied with				
	Disposal receipts for hazardous material attached e.g. soiled hydrocarbon spill mop up products, etc				
All temporary site facilities removed?	Temporary toilets				
	Site area temporary fencing				
	Site containers/offices				
	Equipment and plant				
	Excess materials				
Waste removed?	All wastes removed from site, final litter collection and cleanup undertaken				
Rehabilitation undertaken?	All oil/fuel spills remediated				
	Any chemical spillages/pollution mopped up				
	Any damage to features outside of the site repaired.				
	Revegetation completed as planned.				
	Destination of spoil soils resolved.				
Penalties	All penalties issued accounted for, recipient identified and authorised by all parties and monies paid by contractor				
General	Site clean and tidy?				
Significant environmental incidents/ compliance breaches	**Describe incl. remedial actions:**				

General comments:

Report attached?

ESM confirms all environmental closure requirements have been met; ratified by external auditor:

ESM: _____Signed: _____ Auditor: _____Signed: _____

Date: _____ Date: _____

Appendix: 3

Basic Environmental Education Content

Ecosense
Consulting Environmentalists/Ecologists
Konsulterende Omgewingskundiges/Ekoloë

PO Box 12697
Die Boord, 7613
Phone/fax 021 8864056
E-mail: christine@ecosense.co.za

SHE Induction Training

Please add the following environmental awareness points as part of your SHE induction presentations to new staff at the **AUGRABIES SOLAR ENERGY FACILITY** site:

Basic Environmental Awareness:

1. **Why follow environmental site rules?**
   - Constitution of South Africa = "We have a right to a clean and healthy environment". Preserve environment for future generations.
   - Rules form part of Construction phase Environmental Management Plan – legally binding thus fines, disciplinary action and even removal of staff from site for non- compliance.

2. **No – Go Areas**
   - Stay out of restricted areas e.g. areas of natural vegetation outside of development footprint, drainage lines and neighbouring farm areas. Fines for non-compliance!

3. **Hazardous substances**
   - Hazardous substances to be used, handled and stored safely in accordance with instructions of the Material Safety Data Sheet.
   - **No** oils, fuels, paints or chemicals or polluted wash water or mop up products containing these to be thrown out on site! Must be placed into sealed containers for removal from site.

4. **Fire**
   - No fires and burning of wastes are allowed on site. Braai's at the site camp only (supervised fires). No smoking in vegetated areas or near flammable materials – high fire risk!

5. **Waste Control**
   - Clean work areas daily. Waste must be disposed of in the bins provided on site.
   - Plastics and litter that can blow around shall **immediately** be put into bins.
   - All food waste into bins with scavenger proof lids.
   - Rubble to be kept in central stockpiles and regularly removed.
   - Do not mix clean rubble with rubbish!
   - Explain recycling programme.

6. **Concrete**
   - All concrete mixing at dedicated and controlled batching sites or in mortar trays. Concrete spills must be cleaned up immediately.

7. **Animals**
   - Report problem wild animals e.g. nesting birds, snakes or trapped or injured animals to site management for rescue. Do not feed any wild animal. Know first aid procedure in case of a snake bite.
   - Do not interfere with livestock in neighbouring farm areas!

8. **Material storage/stockpiles**

   - Keep wind-blown sand down –maintain stockpile covers and screens where required.
   - No stockpiling outside of site/in no-go areas.

9. **Vehicles and machinery**
   - Drip trays placed under leaking static plant e.g. pumps, generators, parked vehicles and during servicing and refuelling.
   - Report all leaking machinery and oil/fuel spills immediately. Spills to be treated and machinery to be fixed or remove from site.

10. **Toilets**
    - Report blocked or leaking toilets. Keep toilets clean. Only use toilet paper!

11. **Water wastage**
    - Do not waste water! Repair leaking hosepipes immediately and protect from damage / use correct fittings.

12. **Heritage**
    - Any suspected archaeological/fossil finds or human remains to be reported to site manager immediately and worked stopped in the area until further notice.

Appendix: 4

Method Statement Template

Ecosense
Consulting Environmentalists/Ecologists
Konsulterende Omgewingskundiges/Ekoloë

PO Box 12697
Die Boord, 7613
Phone/fax 021 8864056
E-mail: christine@ecosense.co.za

ENVIRONMENTAL METHOD STATEMENT

This Method Statement is to be completed by the person requiring the work to be undertaken (e.g. the Contractor). This Method Statement will be assessed by the Principal Agent and Environmental Site Manager (ESM) for potential negative impacts on the environment.

The Method Statement can only be implemented once signed off by the Principal Agent as being environmentally acceptable.

The person undertaking the work (the Contractor or his representative undertaking the works on the site) must also sign the Method Statement, thereby indicating that the works will be carried out according to the methodology contained in the approved Method Statement.

The Principal Agent and the ESM will use the Method Statement to audit compliance by the Contractor with the requirements of the approved Method Statement.

Changes to the way the works are to be carried out must be reflected by amendments to the original approved Method Statement; amendments require the signature of the Principal Agent, denoting that the changed methodology or works are necessary for the successful completion of the works, and as being environmentally acceptable. The Contractor will also be required to sign the amended Method Statement thereby committing him/herself to the amended Method Statement.

This Method Statement MUST contain sufficient information and detail to enable the Principal Agent to apply his/her mind to the potential impacts of the works on the environment. The Contractor will also need to thoroughly understand what is required of him/her in order to undertake the works.

THE TIME TAKEN TO PROVIDE A THOROUGH, DETAILED METHOD STATEMENT IS TIME WELL SPENT. INSUFFICIENT DETAIL WILL RESULT IN DELAYS TO THE WORKS WHILE THE METHOD STATEMENT IS REWRITTEN TO THE PRINCIPAL AGENT'S SATISFACTION.

WHAT work is to be undertaken?

(give a brief description of the works)

WHERE are the works to be undertaken?

(where possible, provide an annotated plan and a full description of the extent of the works)

WHEN are the works to start; what is the anticipated finish date?

HOW are the works to be undertaken?
(provide as much detail as possible – the ESM will assist as required)

DECLARATIONS

1) ENVIRONMENTAL SITE MANAGER

The work described in this Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

_____
(signed) *(print name)*

Dated:

2) PERSON UNDERTAKING THE WORKS

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to the above signatories and that the Environmental Site Manager will audit my compliance with the contents of this Method Statement

_____
(signed) *(print name)*

Dated:

3) PRINCIPAL AGENT

The works described in this Method Statement are approved.

_____ _____ _____

(signed) *(print name)* *(designation)*

Dated:

Appendix: 5

List of Example Hydrocarbon Spill Response Products

List of Example Hydrocarbon Spill Response Products and Suppliers

It should be noted that this list is by no means exclusive, and that other bio-remediation measures and products should also be investigated.

	Spill Supply Services	
	CONTACTS	
	Jerry Haldane	
	Tel. (021) 948 6181	Tel. (021) 948 6181
	Cell. 0828829006	Cell. 0828829006
	PRODUCTS	
	Spill Sorb (bales, booms, pads, mats and cushions) – hydrocarbon encapsulation	
	Oil Gator - microbial bioremediation product for spills on soil and shale	
	Pinelands Environmental Technology	
	CONTACTS	
	Chris Davidson	
	Tel. (021) 531 3749/50	Fax. (021) 531 3903
	Cell. 082 464 1074	
	PRODUCTS	
	Chemcap – Oil dispersant and degreaser	
	Enviroserv Waste Management (Pty)Ltd	
	CONTACTS	
	(021) 951 8420	(021) 951 8440
	info.ct@enviroserv.co.za	
	PRODUCTS	
	Wide range of spill kits and products	
	Bio Systems SA	
	Po box 136	
	Simonstown 7995	
	Cape Town, South Africa	
	www.biosystems.co.za	
	PRODUCTS	
	For municipal, domestic industrial and agricultural	

5. OPERATIONAL PHASE MANAGEMENT PLAN (OEMP)

This module provides management procedures and guidelines to ensure sound environmental management during the operational life of the project.

5.1. INTRODUCTION

The operational phase of the facility is initially estimated at approximately 25 years, after which its operational life can be extended/new technology employed or it may be decommissioned. Operational activities mainly consist of module cleaning, regular maintenance of the PV panels and the electrical equipment (mainly inverters) and maintenance of access roads and fencing. Maintenance is done on a regular basis. A few surveillance and security staff are required on site on a full time basis.

5.2. INTERPRETATIONS

For the purposes of this OEMP the following abbreviations and definitions shall apply:

DEA	Department of Environmental Affairs (formerly DEAT)
DWA	Department of Water Affairs (formerly DWAF)
EA	Environmental Authorisation – issued by DEA
MSDS	Material Safety Data Sheet
OEMP	Operational Phase Environmental Management Plan
SAHRA	South African Heritage Resource Agency - the statutory body responsible for heritage resource management

Municipality	Refers to the Kai! Garieb Municipality
Environment	The aggregate of surrounding objects, conditions and influences that influence the life and habits of man or any other organism or collection of organisms.
Environmental Management Plan	Environmental management plans forming part of the overarching Environmental Management Program (EMPr), namely the Construction phase Environmental Management plan (CEMP), the Operational Phase Environmental Management Plan (OEMP) and the Decommissioning Environmental Management Plan (DEMP).
Operator	The company operating the facility.
Site	The development property.
Structure	Means any man-made feature affixed to the ground or attached to something

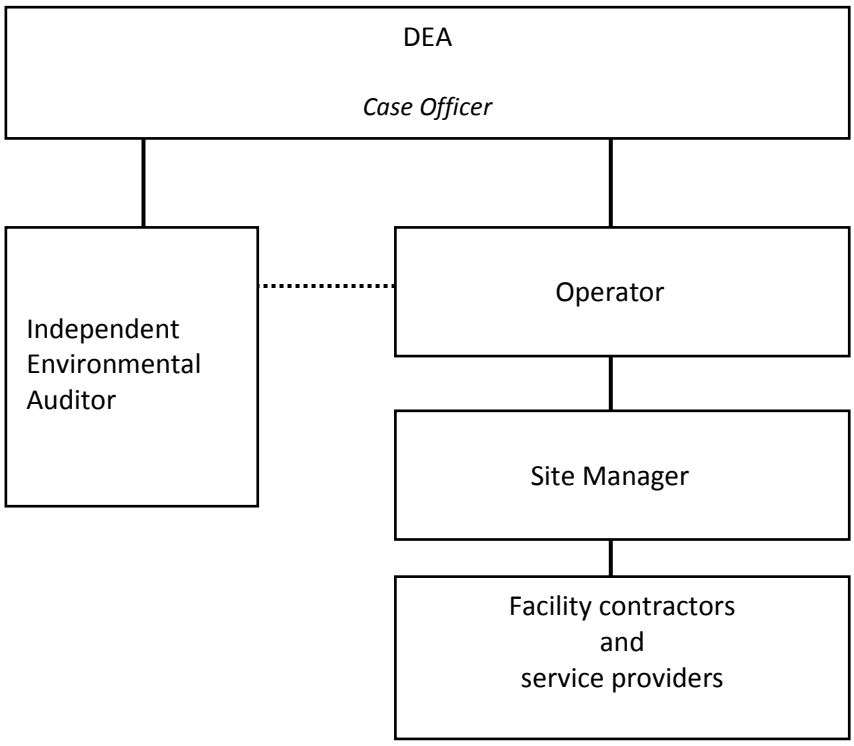
	located on the ground, including but not limited to fences, walls, berms, levees, fill, storage tanks, shelters or buildings.
Stormwater	Water resulting from natural precipitation and/or accumulation and includes rainwater, groundwater and spring water, but excludes water in a water or wastewater reticulation system.
Topsoil	The top 150 mm of soil; may include vegetation and rocks

5.3. RESPONSIBILITIES AND ORGANISATIONAL STRUCTURE

The organisational structure for environmental management of the Solar Facility is depicted in Figure 6 below.

Figure 6: OPERATIONAL ENVIRONMENTAL MANAGEMENT ORGANISATIONAL STRUCTURE

<to be amended when new information becomes available>



KEY:

..... - Advisory Role

——— - Reports/Responsible to

Implementation of the OEMP will be the responsibility of all parties involved with the management of the facility. The responsible parties are expected to co-operate closely to minimise or avoid unnecessary environmental impacts.

In the context of this document the specific responsibilities of each of the role players are as follows:

5.3.1. Operator

- Ensure compliance by all parties under their control with requirements of the OEMP as well as with conditions imposed by DEA, the municipality or any other authority with respect to ongoing management of the facility.
- Ensure that all land uses on the site are authorised by relevant approvals and permits and that environmental authorisation is sought for any expansion activities that may be proposed that trigger an authorisation process.
- Liaise with DEA regarding significant matters of concern pertaining to environmental management.
- Finance the environmental management requirements as outlined in the OEMP including the external audits to be undertaken by an independent environmental consultant per section 5.5. of this OEMP.
- Review the OEMP annually, with input from the management staff and propose relevant changes for the approval of DEA.
- Make all relevant parties aware of changes in environmental management requirements.
- Ensure that any avoidable environmental damage occurring on the site, or any adjacent property, as a result of any activity on site, is repaired at the cost of the party responsible for the damage.
- Maintain all vegetated areas, private internal roads and infrastructure.
- To enter into agreements with service providers, including waste removal and security services.

5.3.2. Site Manager

The Site Manager refers to a person employed by the Operator to oversee and manage the implementation of the OEMP management requirements on the facility site.The Site Manager will be responsible for:

- Undertake regular site inspections to assess the level of compliance with the OEMP. Report to the Operator any serious compliance issues and ensure that non compliances are rectified on the site.
- Ensure that all service providers working on the site are aware of their responsibilities in terms of the OEMP requirements.
- Control environmental management during construction of new structures, external renovations, alterations and/or additions to existing structures per the requirements of the CEMP and resolve issues relating to environmental protection if required.
- To be familiar with relevant environmental, health and safety legislation (and associated regulations) applicable to the facility, and make all relevant parties aware of any changes or updates to the legislation.
- Keep a copy of all environmental records in an environmental file e.g. updated OEMP, site photographs, conditions of approval, Environmental Auditor's reports etc. This file must be made available to the Environmental Auditor during each audit.
- Facilitate the external environmental audits through proper record keeping, reviewing the OEMP regularly and proposing changes to keep the management requirements relevant and practical and by accompanying the external environmental auditor on a tour of the facility and site, answering any queries.

5.3.3. Contractors

- Abide by all guidelines, conditions and specifications imposed by the Operator, including the requirements of the OEMP relevant to their scope of works.
- Ensure that all activities related with construction work (for replacement/maintenance etc.) are undertaken in accordance with the construction specification procedures contained within the Construction phase Environmental Management Plan (CEMP) contained in the EMPr for the development.

5.3.4. DEA

- Receive and if required, comment on the external environmental audit reports specified by this OEMP.
- Liaise with the Developer regarding any situations or issues of concern to DEA pertaining to environmental management on their Site.
- Approve proposed changes to the OEMP resulting from an internal review or as a result of an external environmental audit.
- Address significant and repeated breaches of the OEMP or EA requirements through the departmental enforcement channels.

5.4. SOCIAL RESPONSIBILITIES

The Operator shall encourage and implement wherever possible the procurement of locally based labour, skills and materials as well as skills transfer to staff working on the project.

This includes:

- maximizing opportunities to local and regional SSMEs and other businesses to provide a range of services, which may include, but not limited to, security, catering, transport services;
- preparation of a labour recruitment strategy to maximise job opportunities for people from the Augrabies area;
- Skills transfer to unskilled labour.

5.5. FINANCING OF ENVIRONMENTAL CONTROL

Financing of environmental control requirements outlined in this document, as they relate to the operational management phase of the project, is the responsibility of the Operator unless where another party has been identified as responsible party.

The Operator is to determine and allocate the required funding to ensure that all the environmental requirements can be implemented as required by the OEMP.

5.6. REVIEW OF OPERATIONAL PHASE EMP

The OEMP document is to be reviewed by the appointed environmental consultant at least 3 months prior to the commencement of operational activities on site and if amendments need to be made, the updated document submitted to DEA for approval.

The Site Manager shall conduct an internal review of the OEMP on an annual basis. In addition the OEMP shall be formally reviewed as part of each external audit (see Section 5.5) to allow for changes

recommended by the auditor (in addition to those made by the Site Manager during his annual review) to be incorporated into the audit report for consideration by the DEA.

The Department of Environmental Affairs is responsible for the final approval of any changes made to the OEMP. All such amendments to the OEMP will be in the form of an appendix, to be attached to the original document. All individuals or organizations responsible for the implementation of the OEMP, are to be provided with a copy of any such appendices produced. These appendices are to provide a clear reference to which sections/specifications within the document have been updated.

5.7. MONITORING AND AUDITING

The Operator via the Site Manager will carry the responsibility of monitoring the implementation of the OEMP on site by all relevant parties, on an on-going basis.

External audits of the implementation of the OEMP (including the conditions of the Environmental Authorisation) are to be undertaken by suitably qualified and experienced environmental consultants. These audits are to be undertaken 1 year after commencement of the operational phase, 1 year after the first audit and every 4 years thereafter. (*NOTE: If the DEA requires alternative auditing frequencies in the Environmental Authorisation then the DEA's requirements shall take preference.*)

The quoting professionals should clearly and in detail lay out their audit protocol and techniques when proposals are called for. The purpose of this exercise is not only to audit compliance with the environmental management requirements set out in this document, but also relevance of the OEMP to the site conditions and environmental management requirements at the time (refer to section 5.5 above).

Following each audit, the Auditor is to produce an audit report which:

- Evaluates environmental management on site in terms of the requirements of the OEMP,
- Provides recommendations for improved environmental management on site,
- Identifies requirements of the OEMP which are no longer relevant or applicable,
- Identifies new environmental concerns on site, and provides additional management specifications, where required.

The first audit report must indicate the date on which construction commenced and the date on which it was completed, as well as the date on which the facility became operational and must include proof of compliance with all the conditions of the Environmental Authorisation.

All audit reports are to be submitted by the Auditor to the Operator for their records and action. A summary report of the key finding of the audit as well as any proposed changes to the OEMP as contemplated in section 5.5 shall be submitted to the DEA. They will have 30 days to comment after which the proposed management practice changes will be deemed accepted and the OEMP document will be updated accordingly.

5.8. STRUCTURE OF MANAGEMENT SPECIFICATIONS

The management specifications are set out as follows:

1. **Legislated Requirements**
   Some of the most pertinent legislation, but not necessarily a comprehensive list, that applies to the each management section.

2. **Background**
   Background to site-specific conditions and/or the environmental impact being mitigated.

3. **Objectives**
   What the management specifications are trying to achieve

4. **Performance Indicators**
   Identifies indicators that demonstrate the level of compliance with a procedure.

5. **Procedures**
   The actual management specifications that aim to avoid or mitigate potential environmental impacts.

6. **Monitoring and Reporting**
   Describes the frequency and type of monitoring of each management section and how and in what forum this is reported on.

7. **Responsibilities**
   Describes who is responsible for what in terms of implementing the management specifications.

8. **Related Documents**
   Describes related documents that may exist containing guidelines or requirements related to environmental management.

5.9. MANAGEMENT SPECIFICATIONS

The management specifications applicable to the operational phase of the development follow:

EMP SECT 5.9	1. STORMWATER MANAGEMENT AND EROSION CONTROL		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Water Act (No 36 of 1998) General Authorisation section 3.7

2. Background

- Natural stormwater runoff will be restricted to surface sheet flow across most of the site. Erosion potential is limited on the flat parts of the site but higher in the area of significant drainage lines.
- However the panel surfaces themselves catch significant water and have the potential to concentrate large volume water flows during heavy rain. Management of this stormwater runoff requires careful attention.

3. Objectives

- Prevent contamination of storm water run-off from the facility to prevent pollution of receiving environments.
- Prevent localised flooding/ water logging on site by ensuring that the stormwater drainage is not impeded e.g. through sediment build up and debris and remains functional.
- Avoid/minimize potential erosion by reducing the speed of drainage flows from the panels and by maintaining the stability of slopes, drainage lines and previously disturbed areas on site.

4. Performance Indicators

- Stormwater channels/drainage lines are free of debris and are functional.
- No indication of significant erosion or water logging on the Site.

5. Procedures

- Ground surfaces must be properly maintained in a stable condition to avoid water erosion impacts.
- In particular, stormwater runoff from the solar panels must be managed to avoid erosion damage. Dissipation into the immediate environment is preferable to artificially canalising water and draining it away as this would change the hydrological profile of the site (impacts on vegetation, drainage line habitats etc.) Measures need to be employed and maintained to avoid erosion where the sheet flow from the panels reaches the ground - refer to the Design phase EMP section 3.2.2.10.
- Activities on the site e.g. new construction and maintenance shall not lead to blockages or disruption of the stormwater drainage lines or concentrate stormwater sheet flow into erosive channels.
- All erosion channels anywhere on site shall be repaired immediately through backfilling with appropriate material and stabilising to prevent recurrence.
- Where vegetation has been washed away or damaged as a result of the erosion this shall be reinstated once the area has been stabilised.
- No materials or wastes shall be dumped into stormwater drainage lines. Any litter/foreign material blown or washed into these areas inadvertently is to be removed regularly (minimum monthly) without undue disturbance to the vegetation/ stability of the area.

- Fuel and oil spills anywhere on site are to be treated immediately with an appropriate mop-up or bio-remedial product as directed by manufacturers to prevent contamination of runoff.

6. Monitoring and Reporting

- The **Site Manager** is to inspect stormwater drainage lines on site at least fortnightly for foreign matter/litter and shall log pollution/obstruction incidences and plan maintenance activities accordingly.
- The **Site Manager** is to inspect impacts of stormwater runoff from the solar panels during/after significant rains to see if the water is draining effectively without erosion damage and plan maintenance activities accordingly.
- The **external environmental auditor** shall inspect the site and stormwater drainage lines on site for evidence of significant erosion and pollution during formal audit inspections.

7. Responsibilities

- **Site Manager:** to implement the above procedures.

8. Related Documents

- **Specification 6** and **13** of this OEMP.

EMP SECT 5.9	2. DUST CONTROL		
Version no	01	***Date***	March 2012

1. Legislated requirements

- NEM: Air Quality Act (No. 39 of 2004) (Dust)

2. Background

- Dust may be generated from vehicles using gravel access roads and from wind crossing unstable areas e.g. disturbed areas with recovering vegetation.

3. Objectives

- Minimize dust generation and associated nuisance.

4. Performance Indicators

- No evidence or reports of significant dust problems.

5. Procedures

- Unconsolidated areas with poor vegetation cover/recovery shall be monitored for dust generation during windy conditions and stabilised if required e.g. through vegetation establishment or application of soil binders e.g. Dustex.
- Operator vehicles to keep to a 40km/hr speed limit on gravel access roads on site to minimise dust generation.
- Avoid the use of water for damping down dust on roads wherever possible as this is a short lived/inefficient use of this resource.
- Ensure establishment of vegetation in previously disturbed areas by implementing Specification 6 of this OEMP.

6. Monitoring and Reporting

- The **Site Manager** must monitor for compliance as per the procedures above.
- The **external environmental auditor** shall check and comment on the level of vegetation cover/stabilisation of unconsolidated areas to limit dust generation.

7. Responsibilities

- **Site Manager:** must ensure that adequate dust control measures are implemented on the Site.

8. Related Documents

- **Specification 13** of this OEMP

EMP SECT 5.9	3. WATER USE		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Water Act (No 36 of 1998): Section 3(3), 77, 22(2)c.

2. Background

- Water is required for ablution facilities, cleaning water for the solar modules, irrigation for trees/rehabilitation areas etc.
- It is anticipated that fairly low quantities will be consumed by the project.

3. Objectives

- Use water in a responsible way on the Site to minimize consumption and prevent wastage of this limited resource.
- Prevent unauthorised water abstraction e.g. via unmetered/unauthorised boreholes.

4. Performance Indicators

- No undue water wastage observed.
- No visible water leaks.
- No unauthorised boreholes observed on site.

5. Procedures

A. Abstraction

- Boreholes must be metered and abstraction volumes monitored. If more than 10 000l is extracted on any given day, the borehole is required to be registered with the Department of Water Affairs.

B. Wastage

- Wastage of water shall be avoided at all times. Only proper hoses and fittings in good repair shall be used on site. All taps shall remain properly closed when not in immediate use and all broken pipes / fittings shall be isolated immediately and repaired as soon as possible.

C. Prevention of Water Pollution

- The pollution of surface or ground water shall be prevented. Such pollution could result from the release, accidental or otherwise, of chemicals, oils, fuels, sewage, water carrying soil particles or waste products etc.

6. Monitoring and Reporting

- The **Site Manager** shall monitor for water leaks or wasteful practices by staff.

- The **external environmental auditor** shall check that water is being abstracted from a legitimate source. Any significant water leaks observed during the site inspection shall also be noted.

7. Responsibilities

- **Site Manager:** is responsible for implementing responsible water usage practices including the procedures stipulated above.

8. Related Documents

- **Specification 6 and 13** of this OEMP.

EMP SECT 5.9	4. HAZARDOUS MATERIAL HANDLING AND STORAGE		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Hazardous Substances Act (No. 15 of 1973) and Hazardous Chemical Substances Regulations (August 1995)

2. Background

- Hazardous substance refers to a substance scheduled in the Hazardous Substances Act (No. 15 of 1973) and Hazardous Chemical Substances Regulations (August 1995). These include fuels, oils, solvents, cement, pesticides, etc.

3. Objectives

- To ensure safe and proper storage, handling and disposal of hazardous substances on the Site so as to avoid environmental pollution and human health risks.

4. Performance Indicators

- No pollution incidents reported or observed on the Site.

5. Procedures

- All hazardous substances, as scheduled by the Hazardous Substances Act (No. 15 of 1973), shall be strictly handled, stored and disposed of as per the manufacturer's specifications. Material Safety Data Sheets (MSDS) for all hazardous materials used on site shall be available on the Site Manager's environmental file for reference e.g. in first aid cases, to guide personal protective equipment use, to guide spill clean ups etc.
- No waste hazardous substances may be disposed of on the Site. These shall be directed to a hazardous waste disposal site or collected by a waste contractor licensed to handle and dispose of this type of waste.

6. Monitoring and Reporting

- The **Site Manager** shall inspect storage/handling areas regularly to ensure that they meet requirements and any suspected hazardous substances spills are immediately cleaned.
- The **external environmental auditor** is to check if any hazardous substances are stored on site and that the correct procedures are followed, including that the relevant MSDS on file.

7. Responsibilities

- The **Site Manager** is responsible for the implementation of these specifications on site.

8. Related Documents

- **Specifications 9**, **11 and 13** of this OEMP.

EMP SECT 5.9	5. CONSTRUCTION WORK		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993) and its Construction Regulations (July 2003).
- National Environmental Management Act (No 107 of 1998)

2. Background

- Subsequent to the initial construction of the facility, maintenance/replacement activities could result in further construction works being undertaken during the operational phase.
- Construction activities are controlled by the procedures outlined in the Construction phase Environmental Management Plan (CEMP) found in section 4 of the overarching EMP for the development.

3. Objectives

- Minimize potential negative impacts of construction activities on the immediate and surrounding natural and social environment.

4. Performance Indicators

- Alterations are authorised by the existing Environmental Authorisations.
- Compliance with the CEMP for this development.

5. Procedures

- Prior to any significant alterations or expansions to the established facility, the operator must ensure that these are authorised by the current Environmental Authorisation. If not the appropriate amendment/application processes must be followed prior to construction work commencing.
- Requirements for environmental control during construction work involving new structures, renovations, alterations and additions to the existing facility, as specified in the CEMP, must be implemented by all contractors carrying out such works.

6. Monitoring and Reporting

- **Site Manager**: will monitor the compliance with these procedures and the requirements of the CEMP.
- **External environmental auditor** is to check whether significant construction is taking place on site and whether parties undertaking the work are aware of the CEMP requirements.

7. Responsibilities

- **Developer and Operator** are to ensure that any proposed construction activities are authorised under current environmental approvals.
- **Site Manager**: will ensure that all contractors on site are made aware of their obligations in terms of the CEMP.

8. Related Documents

- **EMPr Section 4**: CEMP - refer to Specifications 1 -20 (Procedures and Breach sections)
- **Specification 13** of this OEMP

EMP SECT 5.9	6. MANAGEMENT OF VEGETATION REHABILITATION AREAS		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Conservation of Agricultural Resources Act (Act 43 of 1983) Regulation 15 (removal of weeds/invaders)
- Northern Cape Nature Conservation Act (2009)

2. Background

- Establishment of vegetation in the areas disturbed by construction will serve to stabilise the areas and reduce the potential for dust generation.
- No significant infestations of alien invasive plant species have been recorded on site. These shall not be allowed to be introduced.

3. Objectives

- Natural re-establishment of vegetation in areas previously disturbed by construction to stabilise the site and improve aesthetics.
- Stabilisation of soils.
- Control of alien invasive plant species.
- Avoid ecological damage through misuse of pesticides and fertilizers.
- Conserve water though responsible irrigation practices.

4. Performance Indicators

- Evidence of germination and successful establishment of vegetation in areas prepared for rehabilitation.
- No alien invasive plants (in terms of Conservation of Agricultural Resources Act) or otherwise potentially invasive exotic species or prohibited plant species are present in the rehabilitation areas.
- No damage/pollution to the environment through the indiscriminate use of pesticides observed.
- Evidence of stabilisation of soil where soil is vulnerable to wind erosion as a result of previous construction disturbance or where plants have been "shaded out" by the solar panels.

5. Procedures

A. General

- Natural recovery of the natural vegetation remnants left on site and areas disturbed by construction shall be allowed. The Operator shall make provision for alien plant control and exclusion of damaging traffic and grazing livestock e.g. by means of the perimeter fencing.

B. Vegetation trimming under solar panels

- Vegetation re-establishing under/around the panels will need to be clipped so as to not shade/interfere with the panels.

- Trimming shall be done in such a way that the plant can remain growing i.e. the plant shall not be removed by the roots but rather trimmed periodically so that it does not interfere with the infrastructure but still remains to stabilise the soil.
- Herbicides shall not be used to control natural plant growth for the purpose.

C. Tree establishment

- There may be a need to establish locally indigenous tree species on the Rooipad 9/15 farm to assist with visual screening of the development.
- Should this be the case and fertilisation is required during establishment, only organic fertilizers shall be used.
- Irrigation is only to be considered for initial establishment of the trees. Their planting shall co-incide with the months receiving the most natural rainfall and an allowance shall be made for watering (e.g. by means of a water tanker) at a rate of up to 60 litres per tree (depending on the size of the tree at the time of watering) every two weeks for the first year of establishment.

D. Use of Chemicals/ Pesticides

- The use of poisonous chemical pest control should be avoided.
- The use of any cleaning chemicals for the panels (if required) shall be strictly monitored and controlled so that their long-term use does not cause damage to the natural plant growth or the soil potential (which would have consequences on the decommissioning phase in particular).

E. Plant Species

- Natural re-vegetation from the natural seed bank on site is favoured over the introduction of foreign seed/seedlings (excluding trees establishment considered in section c above). Any seeding/introduction of plant material must thus be endorsed by a professional botanist that has experience with the veld type on site (Blouputs Karroid Thornveld). No species listed under the National Conservation of Agricultural Resources Act (Act 43 of 1983) or any amendments thereto, are to be introduced/allowed to establish on site.

F. Removal of Alien Invasive Plants

- All Category 1 and 2 alien invasive vegetation as directed by the National Conservation of Agricultural Resources Act (Act 43 of 1983) or any amendments thereto, are to be removed from the Site on a continuous basis (minimum bi-annually) if any become established on site.
- The plants should be removed by hand while young. Seedlings should not be allowed to grow to a size where they have reached seed bearing age or requiring expensive mechanical or chemical controls.

G. Mulching

- Maintain a mulch layer (e.g. wood chip) or use brush packing in areas where soils need protection from wind erosion in disturbed sites or in areas shaded out by the panels.

6. Monitoring and Reporting

- The **Site Manager** shall monitor all rehabilitation areas to ensure that they are establishing well and are free from alien invasive vegetation.

- The **external environmental auditor** is to comment on the progress and success of revegetation on site.

7. Responsibilities

- **Operator**: is responsible for the ongoing maintenance of rehabilitation areas on site.

8. Related Documents

- Nil.

EMP SECT 5.9	7. INFRASTRUCTURE MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

2. Background

- This Section deals with the maintenance of infrastructure e.g. cabling, access roads, fencing etc.

3. Objectives

- Ensure that no ecological degradation takes place as a result of poorly maintained roads or poor fencing (e.g. livestock damage to rehabilitation areas).

4. Performance Indicators

- Infrastructure visibly in good repair and operational areas kept tidy.
- The footprint of the operations and maintenance facilities, parking and vehicular circulation is clearly defined with no "spill over" into other areas of the site.
- Roads are clean and free of debris/litter.

5. Procedures

- All infrastructure must be maintained and any damage repaired regularly to remain in a functional condition at all times.
- All operational areas shall be kept neat and tidy at all times.
- The footprint of the operations and maintenance facilities, parking and vehicular circulation must be clearly defined e.g. through the use of fencing and markers were practical, to avoid "spill over" into other areas of the site.

6. Monitoring and Reporting

- The **Site Manager** shall undertake visual spot checks on a fortnightly basis to check for deterioration or incidental damage of infrastructure and plan and carry out maintenance accordingly.
- **External environmental auditor** shall check that infrastructure is in good repair.

7. Responsibilities

- **The Operator** is responsible for maintaining all infrastructures under their control in a functional and aesthetically pleasing condition.

8. Related Documents

- **Specification 13** of this OEMP.

EMP SECT 5.9	8. ANIMALS ON SITE		
Version no	01	***Date***	December 2013

1. Legislated requirements

- National Environmental Management Biodiversity Act (No 10 of 2004)
- Northern Cape Nature Conservation Act (2009)

2. Background

- Due to the proximity of natural veld, wild animals may be encountered on site.
- Power lines pose a risk to birds through collision or electrocution.
- Social weaver birds potentially make use of any significant structure to build nests, including the PV arrays.

3. Objectives

- Rescue and relocate any trapped animals on site.
- Exclude domestic livestock from rehabilitation areas.
- Prevent domestic animals e.g. uncontrolled dogs from harming wildlife.

4. Performance Indicators

- No evidence of injured wildlife or domestic livestock on site or roaming dogs.
- "Bird flappers" and other measures on overhead power lines to prevent bird collision or electrocution are in a serviceable condition.
- No evidence of domestic livestock in designated rehabilitation areas.

5. Procedures

A. Wild animals

- If wild animals are encountered on the Site, they may not be trapped, captured, disturbed, injured or killed.
- If not threatened, or causing a threat to anyone, the animal is to be left alone.
- If threatened e.g. trapped in an excavation, or causing a threat e.g. a potentially venomous snake, the Site Manager shall arrange for the capture of the animal and release thereof into natural undisturbed veld on the site. Assistance/input from local conservation staff may be required in terms of potential problem or injured animals.
  No untrained person shall attempt to capture a potentially venomous snake.
- "Bird flappers" and other measures to prevent collision or electrocution of birds with the facility's overhead power lines as installed during the construction phase shall be maintained in a serviceable condition.
- The Site Manager shall regularly monitor the PV arrays and other structures for the establishment of Social Weaver nests - if these are likely to cause a problem for the project infrastructure, these shall be removed as soon as construction of the nest starts so that no eggs/young are harmed by nests only being removed once they have become significantly established.

B. Domestic animals

- Dogs may be kept e.g. for security patrol purposes but are not allowed to roam outside the fenced property.
- No domestic livestock shall be allowed to have access to establishing rehabilitation areas.

6. Monitoring and Reporting

- The **Site Manager** shall monitor the site for roaming dogs, undue damage to natural vegetation due to livestock access and any trapped, injured or problem animals as well as the condition of bird anti-collision/electrocution measures on the new power line.
- The **external environmental auditor** shall check for animal rescue records on file (if any), for domestic livestock in establishing rehabilitation areas and presence and condition of bird anti-collision/electrocution measures on the new power line.

7. Responsibilities

- The **Site Manager** shall be responsible for the day to day implementation of these procedures on the site.

8. Related Documents

- **Specification 13** of this OEMP.

EMP SECT 5.9	9. HOUSEKEEPING AND WASTE MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- National Environmental Management: Waste Act (No. 59 of 2008)
- National Water Act (No. 36 of 1998) (protection of water resources)

2. Background

- Solid waste produced during the operational phase is mainly expected to be in the form of maintenance material off cuts or damaged components and packaging as well as domestic refuse from security staff and the maintenance crews visiting the site.
- Relatively little water is used for the cleaning of each of the solar panels and will evaporate quickly i.e. no significant waste water generated.
- Construction waste is dealt with under **section 4.14.5** of the CEMP.

3. Objectives

- Promote waste minimisation and recycling of waste generated on the Site.
- Avoid litter and pollution.

4. Performance Indicators

- No litter/pollution/dumping visible anywhere on the Site. Good housekeeping.
- No evidence of contaminated waste water entering informal soak-away areas.
- Responsible disposal of wastes and employment of waste reduction, recycling and re use opportunities.

5. Procedures

A. General Housekeeping

- The Operator is to keep all working areas and the site in general in a neat and tidy condition at all times, including neat and safe stacking and storage of materials and equipment, and management of waste materials at appropriate intervals.
- All waste shall be removed from site immediately on completion of planned maintenance activities.

B. Solid waste

- Wherever possible and practical, waste materials generated on site shall be recycled. This includes damaged components e.g. for scrap metal etc.
- Packaging cardboard and paper should be separately disposed of for recycling.
- No domestic waste shall be stored on site for longer than one week.
- Hazardous waste such as oil, diesel, petrol, chemicals, paints and solvents are to be disposed of separately from general waste and taken to an approved hazardous waste site or collected by a contractor licensed to handle and dispose of hazardous wastes. Safe Disposal Certificates are required to be retained on file for any hazardous waste disposed of.

- No waste materials may be dumped or temporarily stored in any rehabilitation or protected area.
- No waste shall be burned on the Site without the required burning permits issued by the local authority.
- No littering is permitted on the Site.

C. Waste water

- Prevent discharge of any waste water containing pollutants, such as cements, lime, chemicals and oils and fuels into any informal soak away area on site.

6. Monitoring and Reporting

- The **Site Manager** shall monitor compliance with the specifications and shall retain all waste disposal records.
- The **external environmental auditor** shall check that a recycling system is in place and that recyclables are separated from general wastes, for evidence of litter or poor waste storage and for logged safe disposal records.

7. Responsibilities

- The Site manager shall ensure that these specifications are complied with and shall be responsible for the record keeping associated with waste management.

8. Related Documents

- **Specification 5** and **13** of this OEMP.
- **Specification 4.14.5** in the CEMP (Section 4 of the overarching EMPr)

EMP SECT 5.9	10. NOISE AND LIGHTING CONTROL		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993)
- National Environmental Conservation Act (1989) Noise Regulations

2. Background

- The facility is located is in an area known for its dark, starry night skies and thus light pollution must be kept to a minimum.

3. Objectives

- Prevent external lighting from creating light pollution.
- Prevent noise induced hearing loss in facility staff.

4. Performance Indicators

- No records/complaints of excessive lighting creating a nuisance to other land users.
- No records/complaints of noise induced hearing loss sustained by staff while working at the facility e.g. with power tools

5. Procedures

- Appropriate directional and intensity settings are to be maintained on all hooters and sirens. In addition, vehicles' exhaust system silencers shall be correctly maintained.
- Hearing protection shall be issued to staff in work areas where noise levels exceed 85dB or as otherwise specified in the Operator's Health and Safety Plan.
- Lighting shall not be intrusive into the landscape.
- No external area flood lighting may be installed at the facility - emergency maintenance at night shall be undertaken with a portable spot light and security lighting that is activated by motion sensor may be installed. Other outside area lighting e.g. at operations building may be in the form of short range "down lighters" only - refer to the lighting guideline document in the Design EMP.

6. Monitoring and Reporting

- The **Site Manager** shall monitor the site daily with respect to compliance with the specifications.
- The **Operator's Health and Safety manager** shall monitor noise related staff safety issues on an average monthly basis.
- The **external environmental auditor** shall make not of any complaints received pertaining to excessive flood lighting or noise.

7. Responsibilities

- **The Site Manager** is responsible for implementing the requirements of this specification in order to minimize nuisance issues.

8. Related Documents

- **Design EMP - Lighting guidelines and Specification 13** of this OEMP

EMP SECT 5.9	11. FIRE MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Veld and Forest Fire Act (No. 101 of 1998) (fire prevention/control)
- Occupational Health and Safety Act (No 85 of 1993)

2. Background

- The veld on site not specifically prone to uncontrolled veld fires.
- However, flammable and combustible materials brought to site, plant operating on site and informal open fires made by staff outside of designated locations could give rise to uncontrolled fires.

3. Objectives

- Maintain the Site so as to reduce the risk of fire.
- Minimize air pollution (through unauthorised burning of wastes etc).

4. Performance Indicators

- No fires in unauthorized locations (e.g. outside of the immediate site office area).
- No unauthorised burning of wastes on site.
- Fire fighting equipment available, accessible and serviceable.
- Fire response and evacuation plan available for the facility.

5. Procedures

A. Fire Prevention

- No waste materials burnt on site unless specifically authorised through a local authority burning permit.
- No open fires to be made by staff outside of the operations centre complex.
- All flammable substances stores shall comply with legislated requirements.

B. Fire Response and Evacuation

- All staff to be aware of the location of fire control equipment on site.
- All fire-fighting facilities/equipment within site shall be suitably maintained/regularly serviced.
- In the case of an uncontrolled fire occurring on site, the following actions are to be taken immediately:

  - Contact Local Fire Department/farm fire response team.
  - Warn neighbours of potential danger.
  - Take whatever practical measures are required to bring the fire under control, prior to the fire department arriving on site, without prejudicing the safety of any of the staff.

6. Monitoring and Reporting

- The **Site Manager** is to ensure that all fire equipment inspected at a minimum every 6 months to ensure that it is adequate, accessible and maintained.
- The **external environmental auditor** shall check that a fire response and evacuation plan is in place for the site and that no undue fire risks/fuel loads occur on the site.

7. Responsibilities

- The **Operator** is responsible for training of key members to deal with responding to uncontrolled fires on site.
- The **Site Manager** shall ensure all fire fighting equipment is available on site, that all flammables are safely stored and that no unauthorised fires are made on site.

8. Related Documents

- Operator's Fire Response and Evacuation Plan

EMP SECT 5.9	12. EMERGENCY MANAGEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- Occupational Health and Safety Act (No 85 of 1993)

2. Background

- Emergency situations have the potential to give rise to significant environmental damage e.g. spills, fires etc.
- Emergency management must be dealt with by the Operator's safety department and representative on site.

3. Objectives

- To facilitate efficient response to emergency situations that may arise on site.

4. Performance Indicators

- Emergency management plan in place and up to date.

5. Procedures

A. General:

- Telephone numbers of emergency services, including farm management, the local fire fighting service, police and ambulance shall be posted noticeably at the site office other central location.

B. Fire

- All staff is aware of the procedure to be followed in the event of a fire. Also see **Specification 11** of this OEMP.

C. Chemical/fuel Spill

- In the case of a potentially hazardous chemical spill (hydrocarbon based or otherwise):
  - The source of the spillage shall be isolated.
  - The spill shall be contained using sand berms, sandbags, pre-made booms, and sawdust or other absorbent materials.
  - Cordon off and ensure safety of the spillage area.
  - A specialist cleanup/remediation service provider shall be contracted if required.
  - Mop up/remediate the spillage site.

6. Monitoring and Reporting

- Emergency situations shall be reported by the **Site Manager** to relevant emergency services.

- The **external environmental auditor** shall check emergency incident records.

7. Responsibilities

- The Operator is responsible for compiling an emergency response plan and for the facility and its circulation to all staff and the training of key members to deal with response to such an emergency situation.

8. Related Documents

- **Specification 11** of this OEMP.

EMP SECT 5.9	13. ENVIRONMENTAL TRAINING AND ENFORCEMENT		
Version no	01	***Date***	March 2012

1. Legislated requirements

- The conditions of authorisation for this development in terms of the National Environmental Management Act (No. 107 of 1998).

2. Background

- Failure to adhere to the requirements of the OEMP and the Environmental Authorisation for the facility may result in criminal prosecution initiated by the DEA in terms of the National Environmental Management Act.
- All staff members need to be aware of OEMP requirements that affect their activities on site.

3. Objectives

- To provide training to staff that makes them aware of OEMP requirements.
- To provide methods of enforcement to ensure that the provisions of this OEMP are implemented and to provide recourse for environmental damage.

4. Performance Indicators

- Environmental training attendance registers and content records.
- External Environmental Audit Reports

5. Procedures

- The Operator shall provide all staff on site with training in order to make them aware of the OEMP requirements applicable to them. This training can be provided by the Operator or by an external service provider. Attendance registers must be taken and a record kept of the content of the training provided.
- Key non compliance findings with the requirements of this OEMP and Environmental Authorisation shall be reported on by the external environmental auditor in the formal audit report summaries submitted to the DEA.
- The DEA shall initiate departmental enforcement protocols in the case of significant or repeated non compliances by the Operator.

6. Monitoring and Reporting

- The external environmental auditor shall be responsible for monitoring and reporting regarding compliance with the OEMP per the audit schedule presented in **section 5.5** of this OEMP.
- The external environmental auditor shall check that attendance registers and records of the content of OEMP/environmental training provided are kept on the Site Manager's environmental file.

7. Responsibilities

- The **Operator** is responsible for compliance with the OEMP and the Environmental Authorisation.
- The **Operator** is responsible for training all staff regarding OEMP requirements.

EMP SECT 5.9	14. INCIDENT MANAGEMENT		
Version no	01	***Date***	March 2012

9. Legislated requirements

10. Background

- There is a need to investigate and document significant incidents that occur on the project site (e.g. stormwater related erosion damage, significant dust control issues etc) in order to assess if current OEMP environmental management measures are adequate to address the expected risks on the project.

11. Objectives

- Allocating responsibilities and investigating the cause of significant environmental incidents/OEMP contraventions and making management adjustments were possible to prevent the reoccurrence of the incident.

12. Performance Indicators

- Detailed incident reports on the project site file.

13. Procedures

- Any significant/extraordinary incident (in which significant environmental damage has resulted) occurring on site will be reported to the Site Manager immediately.
- Upon receiving a report of an incident, the Site Manager shall take any action required to contain / isolate the adverse effects.
- Once the incident area has been stabilised, the Site Manager shall complete the incident investigation form (refer to template form at the end of this procedure). This shall include a full investigation into the causes of the incident and how a recurrence can be avoided.
- Once the form has been completed it shall be copied to higher management if required and kept on file for review by the Environmental Auditor.

14. Monitoring and Reporting

- As below.

15. Responsibilities

- The **Site Manager** is responsible for completing incident reports.
- The **external environmental auditor** is responsible for reviewing the incident reports.

16. Related Documents

- The Incident report form that follows:

INCIDENT REPORT FORM					
Section One: To be completed by the person reporting the incident					
Name		**Designation**			
Contact number		**Physical location of incident**			
Describe the incident					
Was there damage/ contamination of/affect on any of the following? (Tick the appropriate box)					
Soils/vegetation		**Water**		**Air**	
Artefact		**Fauna**		**Infrastructure**	
OTHER:					
What remediation has been undertaken? (describe)					
Has the damage/ contamination been completely remediated?					
If not, what residual damage remains (detail the residual damage)?					
If residual damage remains - what is the reason and what is planned with respect to the environmental damage?					
Upon investigation, what was found to be the cause of the incident? (Detail)					
Is this a repeat of a similar incident?					
What is the reason that planned changes did not prevent a recurrence of the incident?					
What is to be changed to ensure that the incident will not be repeated? (Detail)					

Note: In the event of a significant incident which is defined in terms of section 30(1)(a) of the National Environmental Management Act as an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed, the incident shall be reported to the National Department of Water and the Environment and an appropriate incident form completed and submitted to the regional office or as instructed by the competent official.

Other Comments:

_____ _____

Date Site Manager

5.10. APPENDICES

Appendices follow:

APPENDICES

Appendix 1	*Revisions Schedule to this OEMP (Pending)*

Appendix: 1

OEMP Revisions

(pending)

6. DECOMMISSIONING PHASE REQUIREMENTS

Only a basic framework detailing the need and intent of this plan is provided at this time - a detailed Decommissioning Plan will need to be compiled and submitted to the relevant authority at that time if and when decommissioning is planned for the facility. However some decommissioning guidelines/requirements/principles are provided.

Provided that a minimum amount of earth moving is undertaken and the minimum concrete is installed (as considered by the Design phase EMP), it should be possible to rehabilitate the land to a fairly similar condition to the original on decommissioning.

The infrastructure has a design life of a minimum of 25 years. There will be no decommissioning during this expected lifetime unless improved technology or other external factors beyond the current best available information dictates such. Thereafter the facility could be:

- Extended in use; or
- Retrofitted with new equipment; or
- Decommissioned in its entirety.

If no retrofit is agreed, the decommissioning phase would involve removal of posts, frames and panels, cables from underground ducts and fencing. Subsurface concrete pads and subsurface ducts will be left as is (to avoid disturbing the vegetation and soil crust). The operations building will either be demolished or handed over to the landowner for any other use. The vegetation in disturbed areas would need to be rehabilitated to that similar to its pre-development state. All materials stripped the CPV Plant shall be assessed for potential recycling.

These decommissioning actions will be at the operator's expense and be undertaken in terms of a Decommissioning Environmental Management Plan (DEMP submitted for DEA (or equivalent) approval.

As a minimum the DEMP must address:

1. Sequence of decommissioning;
2. A waste recovery/recycling/disposal plan. A requirement for record keeping of quantities of waste and safe disposal proof / receipts must be included;
3. Roads and track rehabilitation;
4. Land use planning - return to original condition, suitability for livestock grazing considered;
5. External audit and due diligence reporting to environmental authority and local authority at closure of decommissioning and for rehabilitation at yearly intervals for 3 years.

It is strongly recommended that the Operator establish an Environmental Rehabilitation Trust Fund to adequately finance decommissioning requirements and the rehabilitation of disturbed areas. This could be funded by a percentage of the revenue generated from the sale of energy from the facility.

7. REFERENCES

7.1. REFERENCES/GUIDELINES/SOURCES OF INFORMATION

a) DEA&DP guideline on Environmental Management Plans May 2006;

b) DEA guideline series on integrated environmental management;

c) *Heritage Impact Assessment for the Proposed Augrabies Solar Energy Facility, Kenhardt Magisterial District, Northern Cape*, Jayson Orton, 24 February 2012;

d) *Agricultural Potential Assessment for Proposed Mulilo Photovoltaic Solar Power Project, Augrabies, Northern Cape*, D.G Paterson, February 2012;

e) *Baseline Botanical Assessment for the Proposed Augrabies Photovoltaic Power Project at Farm Rooipad 15 Portion 9, Augrabies Northern Cape Province*, Dr David J. Mcdonald, February 2012 (updated December 2013)

f) *Paleontological Assessment: Recommended Exemption from Further Paleontological Studies, Proposed Photovoltaic Solar Plant on the Farm Rooipad No. 15 near Augrabies, Northern Cape Province*, Johan E. Almond, February 2012.

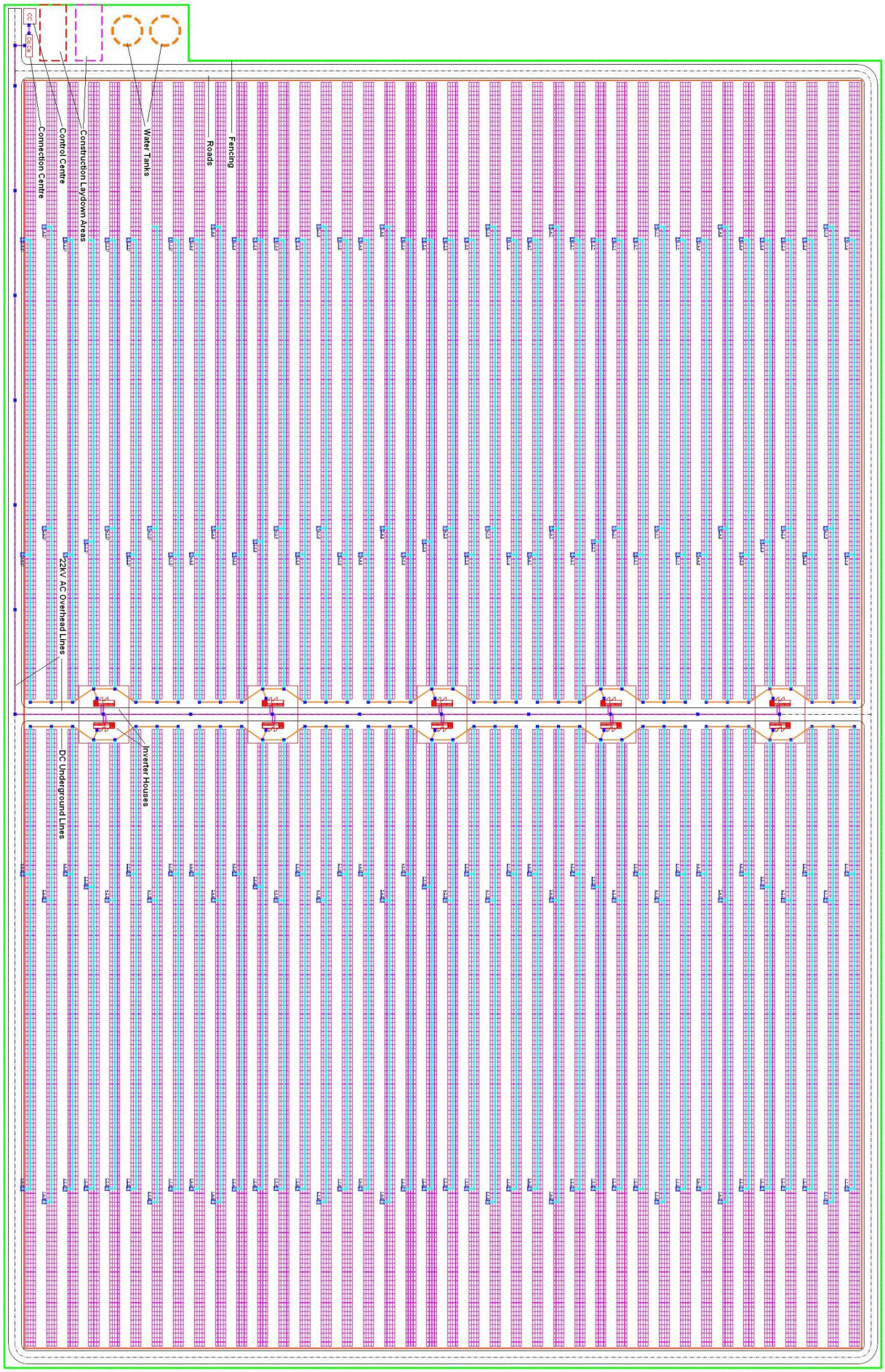
8. EMPr APPENDICES

The general EMPr appendices follow.

Appendix 1	*Site Layout Plan*
Appendix 2	*Planning and Environmental Approvals*

Appendix: 1

Site Layout Plan


Connection Centre
Control Centre
Construction Laydown Areas
Water Tanks
Roads
Fencing
22kV AC Overhead Lines
Inverter Houses
DC Underground Lines

Appendix: 2

Environmental Authorization issued by the Department of Environmental Affairs

<pending>