



**EIA FOR A 10MW PHOTOVOLTAIC (SOLAR) ENERGY FACILITY NEAR
OMARURU, NAMIBIA**

DRAFT ENVIRONMENTAL MANAGEMENT PLAN

16 June 2014

Prepared by:

aurecon

Leading. Vibrant. Global.

www.aurecongroup.com

Aurecon Namibia (Pty) Ltd

Tel: +264 (61) 297 7000

Email:

louise.corbett@aurecongroup.com

Prepared for:



NamPower

Powering the Nation and beyond

Namibia Power Corporation

Tel: +264 (61) 206 9111

Email:

Lahja.Amaambo@nampower.com.na

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Document Control Record

Document prepared by:

Aurecon Namibia (Pty) Ltd
90/469
Aurecon Centre
189 Newton Street
Windhoek
Namibia

T +264 61 297 7000
F +264 61 297 7007
E namibia@arecongroup.com
W arecongroup.com

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Name		Grace Shihepo			Name		Louise Corbett		
Title		Project staff			Title		Project leader		

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ABBREVIATIONS

dB(A)	Decibel
CEMP	Construction Phase Environmental Management Plan
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EO	Environmental Officer
EIA	Environmental Impact Assessment
EMA	Namibian Environmental Management Act (No. 7 of 2007)
EMP	Environmental Management Plan
MAWF	Ministry of Agriculture, Water and Forestry
MET: DEA	Ministry of Environment and Tourism: Directorate of Environmental Affairs
OEMP	Operational Phase Environmental Management Plan
SANS	South African National Standards
SDEMA	Specification Data Environmental Management
TIA	Traffic Impact Assessment

1 OVERVIEW

This document represents the Environmental Management Plan (EMP) for the environmental management of the proposed 10 MW photovoltaic (PV) (solar) energy facility near Omaruru, Namibia (see Figure 1). Namibia Power Corporation (Pty) Ltd (NamPower), the national electricity utility of the Republic of Namibia will select an Independent Power Producer (IPP) to construct, own and operate the PV energy facilities. The contents of the EMP will be binding on all parties who have a role to play in the design, construction, operation and decommissioning of the facilities, as relevant to the roles played.

1.1 PURPOSE OF THE EMP

In terms of the Namibian Environmental Impact Assessment (EIA) Regulations (Government Notice (GN) 28, 29, and 30 promulgated on 6 February 2012) enacted in terms of the Namibian Environmental Management Act (Act no. 7 of 2007) (EMA), the proposed project triggers Activities 1(a; b), 5.1 (c), 8.1, 8.8, 8.9 and 10.1 in terms of Regulation GN 29. As the proposed project triggers activities listed in terms of the Regulations, it is necessary to apply to the Ministry of Environment and Tourism: Directorate of Environmental Affairs (MET: DEA) for authorisation by way of an Environmental Clearance Certificate (ECC).

The EIA process comprised a full Scoping process that included an assessment of all potential environmental impacts as identified through the process. Section 8 (j) of the EIA Regulations require that a draft EMP is submitted as part of the Scoping Report so that these documents can be considered simultaneously.

The 2012 EIA Regulations define a 'management plan' as:

"...a plan that describes how activities that may have significant environments effects on the environment are to be mitigated, controlled and monitored."

The EMP has been included in the Scoping Report to provide a link between the impacts identified in the EIA Process and the required environmental management on the ground during project implementation and operation. The purpose of this document is to guide environmental management throughout the following life-cycle stages of the proposed development, as follows:

- Planning and design,
- Pre-construction and construction, and
- Operation.

According to Namibian Legislation, decommissioning is considered as a separate activity which should be dealt with on its own. The decommissioning of the PV facility would therefore be addressed in a new EIA process to be conducted prior to the site being decommissioned. However, this EMP makes recommendations that should be considered in the new EIA process prior to decommissioning.

This EMP aims to align and optimise of environmental management with any conditions of the environmental clearance, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

The contents of the EMP must meet the requirements Section 8 (j) of the EIA Regulations. The EMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle. It must also include a system for assessment of the effectiveness of monitoring and management arrangements after implementation. NamPower therefore has the responsibility to ensure that the proposed activity as well as the EIA process conforms to the principles of EMA and must ensure that any contractors appointed by them also comply with such principles. In developing the EIA process, Aurecon has been cognisant of this need, and accordingly the EIA process has been undertaken in terms of EMA.

Table 1 below lists the requirements of an EMP as stipulated by Section 8 (j) of the EIA Regulations.

Table 1: Section 8 of the EIA Regulations listing the requirements of an EMP

<i>Requirement</i>	<i>Compliance</i>
<p>8. A scoping report must include-</p> <p>(j) a draft management plan, which includes –</p> <p>(aa) information on any proposed management, mitigation, protection or remedial measures to be undertaken to address the effects on the environment that have been identified including objectives in respect of the rehabilitation of the environment and closure;</p> <p>(bb) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of the activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and</p> <p>(cc) a description of the manner in which the applicant intends to modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation remedy the cause of pollution or degradation and migration of pollutants.</p>	<p>(aa) Please see Tables 4, 5 6, 7 and 8 for the mitigation measures proposed for the various phases of the project lifecycle.</p> <p>(bb) Please see Tables 4, 5 6, 7 and 8 for the rehabilitation measures proposed for the various phases of the project lifecycle.</p> <p>(cc) Please see Tables 4, 5 6, 7 and 8 for the pollution prevention measures proposed for the various phases of the project lifecycle. Sections 3 to 6 describe mitigation measures to avoid and mitigate environmental degradation.</p>

In addition to the EIA, regulation, the MET: DEA Draft Procedures and Guidelines for EIA and EMP (GN 1 of 2008) also aims to inform and guide the preparation and implementation of EMPs. The guidelines are included in Table 2 below.

Table 2: Draft Procedures and Guidelines for EMPs (2008)

<p>An EMP must include the following items:</p> <p>(i) identification and summary of all the significant adverse environmental impacts that are anticipated;</p>	<p>(, ii,iv) Please see Tables 3, 4, 5, 6, 7 and 8 for the mitigation measures proposed for the</p>
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<p>(ii) description and technical details for each mitigation measure, including the type of impact to which it relates and the conditions under which it relates and the conditions under which it is required (e.g., continuously or in the event of contingencies), together with designs, equipment descriptions, and operating procedures, as appropriate;</p> <p>(iii) institutional arrangements with respect to the assignment of the various responsibilities for carrying out the mitigation measures (e.g., responsibilities which involve operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);</p> <p>(iv) implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans;</p> <p>(v) monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures, and provide information on the progress and results of mitigation; and</p> <p>(vi) integration into the total project cost tables of the cost estimates and sources of funds for both the initial investment and the recurring expenses for implementing the mitigation plan.</p>	<p><i>various phases of the project lifecycle.</i></p> <p><i>(iii) An organisational organogram that could be used is suggested in Annexure B. However, the Project Proponent and IPP Contractor will identify the required personnel and responsibilities accordingly prior to construction.</i></p> <p><i>(v) Please see Section 4.2 and Section 6 for monitoring and reporting requirements</i></p> <p><i>(vi) It will be necessary for the IPP Contractor to integrate these items, after appointment</i></p>
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This EMP aims to meet the EMP requirements as legislated by the EMA Regulations as well as complying with the MET Guideline document for an EMP. This document must thus be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available.

1.2 STRUCTURE OF THE EMP

As discussed above, the LEMP aims to address environmental management throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning.

The EMP has been structured to include the following sections:

- Chapter 2: Description of the project
- Chapter 3: Summary of the environmental aspects influencing the planning and design of the proposed project
- Chapter 4: Construction EMP based on identified impacts and mitigation measures from the Scoping Report
- Chapter 5: Operational Framework based on identified impacts and mitigation measures from the Scoping Report

- Chapter 6: Monitoring Programmes
- Chapter 7: Decommissioning
- Chapter 8: Conclusion

2 PROJECT INFORMATION

This section briefly describes the project and the various components as well as alternatives that were considered.

NamPower proposes to buy power from a PV solar energy facility near Omaruru, Namibia. The proposed capacity of the facility will be 10 megawatt (MW) and is anticipated to cover approximately 35 hectares (ha). The solar facility will be connected onto the existing Omburu Substation that is located in close proximity to the proposed site.

The project includes the following components:

- **Photovoltaic infrastructure:** numerous rows of PV panels and associated support infrastructure to generate electricity.
- **Transmission corridor:** one overhead 66kV transmission line located within the transmission corridor to connect the proposed onsite substation to the existing main substation.
- **On-site substation:** the onsite substation to collect the electricity produced onsite and step it up to the correct voltage to transfer via the transmission line to the existing main central substation.
- **Access road corridor:** a corridor to accommodate the access road for constructing, servicing and maintaining the facility.
- **Buildings:** operation and maintenance buildings to house equipment and a guard cabin for security.
- **Additional infrastructure:** a boundary fence for health, safety and security reasons; water supply infrastructure for groundwater abstraction and storm water infrastructure, if required.

Figure 1 depicts the proposed layout of the site.

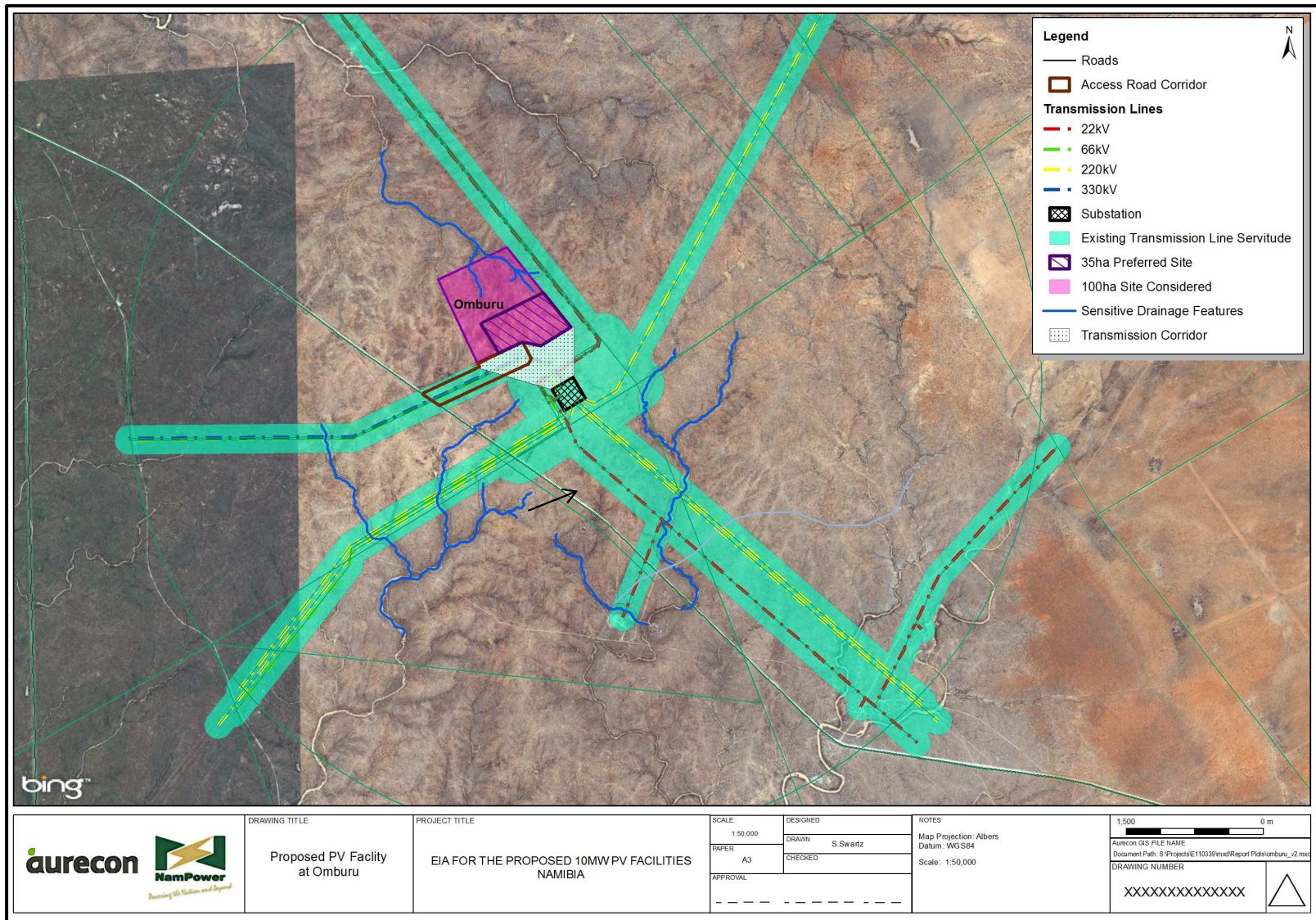


Figure 1: Proposed layout of the 10 MW solar facility near Omaruru

3 PLANNING AND DESIGN

This section outlines how environmental considerations have informed and been incorporated into the planning and design phases of the proposed 10 MW (solar) energy facility near Mariental. Detailed design is usually undertaken as part of the pre-construction phase as it is a costly undertaking which is generally only costed for once all required authorisations have been obtained. Thus, the planning and design phases discussed are limited to those associated with the pre-authorisation phases, but recommendations may be made for detailed design. The following design related mitigation measures have been recommended to reduce the environmental impacts.

3.1 PERMITS REQUIRED

There are a number of permits that may be required for the project to be executed. Some of these can be applied for during the planning phase. Table 3 below provides a quick reference list of list of such permits.

Table 3: Permits and special requirements for the planning and design phase

Planning phase	Permits and special requirements required	Status
Ecology	Permit for removal of protected and unique species.	To be applied for from Ministry of Environment and Tourism by the IPP Contractor and obtained prior to commencement of construction activities.
Socio-Economic	Local recruitment and procurement policy; training and skills development, and awareness programmes.	To be compiled by the project proponent during the planning phase and implemented by the IPP Contractor during construction, operational and decommissioning phases
Traffic and Roads	Obtain permission from Roads Authority to construct access route and to upgrade existing roads.	To be applied for from Roads Authority by the IPP Contractor prior to commencement of construction activities.
Groundwater	Licence to drill a borehole and to abstract groundwater.	Licence for water abstraction to be applied for from Ministry of Agriculture, Water and Forestry (MAWF) by the IPP Contractor prior to commencement of construction activities.

3.2 MITIGATION MEASURES FOR THE PLANNING AND DESIGN PHASE

A number of recommendations were made in the EIA regarding mitigation measures for the design phase of the project. These recommended mitigation measures are summarised below.

3.2.1 Ecology

The following mitigation measures are recommended for the planning and design phase to reduce the impact on the biophysical environment:

- Limit development and associated infrastructure in sensitive areas e.g. ephemeral drainage lines and associated riparian vegetation, rocky ridges (broken terrain).
- Locate access routes and other infrastructure to avoid the removal of bigger trees (i.e. *Acacia erioloba*, *Boscia albitrunca*, *B. foetida*, *Euclea pseudebenus* and *Tamarix usneoides*) as far as possible.
- Design electric boundary fencing (if required) so that the first 50cm from ground level is not electrified to allow for small burrowing fauna. Design overhead transmission lines to include coils/flappers (approximately two coils/flappers within a pylon at equal lengths apart) on new pylon routes longer than 100 m (see Figure 2) to increase visibility and reduce bird mortalities.



Figure 2: A coil attached to the transmission line to increase visibility for pylon sensitive bird species.

- Ensure landscape design prohibits the planting of potentially alien invasive plant species (e.g. *Tecoma stans*, *Pennisetum setaceum*, etc.) for ornamental purposes (e.g. around offices, etc.) and incorporates indigenous vegetation (especially the protected species i.e. *A. erioloba*, *Albizia anthelmintica*, *B. albitrunca*, *B. foetida*, *Faidherbia albida*, *Parkinsonia africana*, *Ziziphus mucronata*) into the developments as far as possible (e.g. around offices, etc.).
- The design must include covers on transformers to prevent owls and genet from nesting on them.
- Design a bund wall around transformers. Transformer oil has a low biodegradation rate and is highly toxic to aquatic ecosystems. The bund wall is to be used to contain oil in case of an oil spill.

3.2.2 Socio-Economic

The following mitigation measures are recommended for the planning and design phase to reduce the impact on the socio-economic aspects:

- The contractor must be required to employ local labour (i.e. from Omaruru area) where possible. The requirement for the employment of local labour must be formalised by incorporating it into the contractor's contract. Quotas for local employment must be set, and the contractor's contract must specify that these positions shall only be filled by non-local persons if it can be demonstrated that no suitable local persons can be identified (e.g. through local advertising) to fill these positions. Follow-up compliance monitoring must also be undertaken.
- Tender criteria must require training and skills development of the contractor workforce by the contractor. Where possible, training must be aimed at providing skills to employees that might allow them to apply for permanent positions during the operation of the facilities.
- The IPP contractor must engage with the relevant regional and constituency committees to encourage and support them in setting up current skills and small-business databases to facilitate local employment and procurement. The databases must include documentation (e.g. utility accounts or affidavits) verifying the local resident status of applicants. The development of these databases must be undertaken well in advance of the construction contractor being appointed.

3.2.3 Traffic and Roads

The following mitigation measure is recommended from a traffic and roads point of view during the planning and design phase:

- The intersection of the access road to the PV site must be designed by a professional engineer and submitted to the Roads Authority (RA) for approval.
- Project Proponent must notify RA well in advance when actual construction will commence.

3.2.4 Visual

The following mitigation measures are recommended for the planning and design phase to reduce the impact on visual resources:

- Limit offices and structures to single storey and site carefully to reduce visual intrusion.
- Select colours for buildings to reflect hues of the surrounding vegetation and/or the ground (grey green). Door and window frame colour must reference either the roof or wall colours.
- Locate the construction yard away from the new access road and retain as much of the adjacent vegetation as possible.
- Limit the size of signage and use colour tones that are visible but not dominating, so that size and colour contrast do not dominate the attention of the casual observer.
- Ensure that fencing is grey in colour and located as close as possible around the PV site.
- Keep facility lighting to a minimum, within the requirements of safety and efficiency. Where lighting is required, use energy savers and design low-level lighting shielded to reduce light spillage and pollution. Use down-lighters for external lighting (including security and perimeter lighting) so that no light falls outside the area needing to be lit and ensure that no naked light sources are directly visible from a distance.

- Should single axis tracking PV technology be used, this must be limited to 8m in height.

3.2.5 Noise

The following mitigation measures are recommended for the planning and design phase to reduce the impact from a noise perspective:

- Ensure that the facility is designed to take into account the maximum allowable equivalent continuous day and night rating levels of the potentially impacted sites outside the project boundary. Where the noise levels at such external sites are presently lower than the maximum allowed, the maximum must not be exceeded.
- Design buildings to minimise the transmission of noise from the inside to the outdoors.
- Insulate particularly noisy plant areas and equipment.
- Keep all plant, equipment and vehicles in good repair.
- Where possible, ensure very noisy activities do not take place at night.

4 CONSTRUCTION PHASE EMP

The Construction EMP (CEMP) aims to address environmental and social risk pertaining to the construction phase as identified in the Scoping Report by outlining the measures that need to be implemented in the lifecycle of the project. This section includes both General Specifications for construction activities (as included in Annexure A), as well as Draft Specification Data in Section 4.2, which address aspects particular to this project. The Draft Specification Data must be revised as required post authorisation, to ensure that any relevant conditions of the ECC have been addressed.

4.1 CONSTRUCTION EMP GENERAL SPECIFICATION

The complete General Specifications have been included in **Annexure A** and include the following sections:

CONTENTS

1 General

- 1.1 SCOPE
- 1.2 DEFINITIONS
- 1.3 NORMATIVE REFERENCES
- 1.4 Supporting specifications and legal framework
- 1.5 Management and administration
 - 1.5.1 Environmental Site Officer (ESO)

2 Contractor Mobilisation and general provisions

- 2.1 Baseline photography
- 2.2 Method statements
 - 2.2.1 Environmental awareness training
 - 2.2.2 Toolbox talks
 - 2.2.3 Construction personnel information posters
- 2.3 Surveying and setting out
 - 2.3.1 Site establishment
 - 2.3.2 Site fencing and demarcations
 - 2.3.3 No Go Areas
- 2.4 Overarching environmental requirements
 - 2.4.1 Protection of natural features
 - 2.4.2 Protection of flora and fauna
 - 2.4.3 Protection of archaeological and palaeontological remains
 - 2.4.4 Noise control
 - 2.4.5 Lighting
 - 2.4.6 Fuel (petrol and diesel) and oil
 - 2.4.7 Contaminated water
 - 2.4.8 Stormwater and drainage
 - 2.4.9 Solid waste management
 - 2.4.9.1 Shutter oil and curing compound
 - 2.4.9.2 Bitumen
 - 2.4.9.3 Hazardous substances
 - 2.4.10 Workshop, equipment maintenance and storage
 - 2.4.11 Materials handling, use and storage

- 2.4.12 Dust
- 2.4.13 Aesthetics
- 2.4.14 Disruption to existing and neighbouring land use activities
- 2.4.15 Temporary site closure
- 2.4.16 Public roads
- 2.4.17 Security and access control
- 2.4.18 Access routes / haul roads
- 2.4.19 Housekeeping
- 2.4.20 Ablution facilities
- 2.4.21 Recess areas and canteens
- 2.4.22 Site clinic or first aid station
- 2.5 Emergency procedures
 - 2.5.1.1 Fire
 - 2.5.1.2 Accidental leaks and spillages
- 2.6 Community relations
- 2.7 Construction Methods and procedures
 - 2.7.1 Site clearance
 - 2.7.2 Demolition
 - 2.7.3 Cement and concrete batching
 - 2.7.4 Earthworks
 - 2.7.5 Dewatering
 - 2.7.6 Bitumen
 - 2.7.7 Erosion and sedimentation control
 - 2.7.8 Crane operations
 - 2.7.9 Trenching
 - 2.7.10 Drilling and jack hammering
 - 2.7.11 Stockpiling
 - 2.7.12 Site closure and rehabilitation
 - 2.7.13 Temporary revegetation of the areas disturbed by construction

3 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

- 3.1 Compliance
- 3.2 Penalties
- 3.3 Removal from site and suspension of Works

4 MEASUREMENT AND PAYMENT

- 4.1 Basic principles

4.1.1 General

4.1.2 All requirements of the environmental management specification

4.1.3 Work "required by the Engineer"

4.2 Billed items

4.2.1 Method Statements: Additional work

4.2.2 All requirements of the environmental management specification

4.2 PROJECT SPECIFICATIONS

The following section provides the Draft Specification Data specifically applicable and related to the environmental requirements for the proposed 10 MW (solar) energy facility near Omaruru, Namibia which, along with the General Specifications (see Annexure A), shall be included in all contract documentation associated with the proposed project and will accordingly be binding on the Contractor.

Scope: The general principles contained within this Specification Data: Environmental Management shall apply to all construction related activities. All construction activities shall observe any relevant environmental legislation and in so doing shall be undertaken in such a manner to minimise impacts on the natural and social environment.

Interpretations: Where any discrepancy or difference occurs between the provisions in this Specification Data: Environmental Management and the General Specifications, the provision of this Specification shall prevail.

Working Area: The land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the areas approved in the ECC for the PV facility, site office, stockpiles, batching areas, the construction area, all access routes and any additional areas to which the Project Manager permits access. The construction footprint must be kept to a minimum.

Roles and Responsibilities: The purpose of this section is to define roles for personnel and to detail their respective responsibilities in the execution of the CEMP. The key role-players for the project are MET:DEA, NamPower as Project Proponent, the IPP Contractor and an Environmental Control Officer (ECO) for environmental monitoring of the Construction and operation EMP. An organisational structure must be developed to ensure that:

- There are clear channels of communication;
- There is an explicit organisational hierarchy for the project; and
- Potential conflicting or contradictory instructions are avoided.

All instructions and official communications regarding environmental matters shall follow the organisational structure as determined by the Project Proponent. In terms of the recommended organisational structure, all instructions that relate to environmental matters should be communicated to the IPP Contractor. The only exception to this rule would be in an emergency (defined as a situation requiring immediate action and where failure to intervene timeously would, in the reasonable opinion of the ECO (or equivalent), result in unacceptable

environmental degradation), where instructions may be given directly to the Contractor¹. The detailed roles and responsibilities of the various role-players identified in the organisational structure are described in Annexure B, where an example of a typical organisational structure that could be used as a base is attached. Whatever the structure adopted by Project Proponent, it is essential that the responsibilities outlined in Annexure B are assigned to specific parties with the capacity and experience required to implement the EMP.

4.3 STRUCTURE OF THE CEMP

Each activity identified in the Scoping process comprises various aspects, which have associated impacts. These, along with the mitigation measures and performance indicators, are outlined in the table below.

Five main categories have been identified and tabled for the CEMP namely:

- General
- Establishment of the working area
- Clearing of the site
- Construction of the PV facility and associated infrastructures
- Removal of the construction related debris, materials or equipment

The information is summarised in Tables Table 4, Table 5, Table 6 and

¹ It should be noted that there is likely to be a considerable amount of informal communication between the ECO (or equivalent) and the Contractor's environmental representatives. However, where such communication (1) represents an instruction, (2) could lead to liability on the part of the Employer or Engineer or (3) could have financial implications, this must be addressed through the formal channels of communication defined in the organisational structure.

Table 7 below illustrating the aspect, impact, mitigation measure, performance indicators, responsibility, schedule and verification. These criteria are listed and explained below:

- Aspect: the aspect of the component/ activity of the project which will be impacted.
- Impact: the environmental impact identified and to be mitigated.
- Mitigation measure: measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact – mitigation is divided into the following:
 - Objective: desired outcome of mitigation measure.
 - Mechanism: method of achieving the objective.
- Performance indicators: outcomes that will indicate achievement of objective/s.
- Responsibility: party or parties identified for implementation of mitigation measure/s.
- Resources: available resources to aid implementation of mitigation.
- Schedule: timeframe in which identified impact and mitigation measure is anticipated to occur.
- Verification: party or parties identified as responsible for review and assessment of final outcome.

Table 4: CEMP: General specification

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
1.	Communication	Inability to communicate the environmental obligations effectively to responsible parties can result in unnecessary environmental degradation. It can also compromise the health and safety of employees as well as disruption to existing infrastructure.	Objective: To ensure that the construction activities do not result in avoidable impacts on the environment by anticipating and managing the impacts. Mechanism: 1) The contact details of the key construction team must be available to all relevant parties. 2) All site instructions pertaining to environmental matters issued by the IPP Contractor are to be copied to the ECO. 3) All sub-contractors, employees, suppliers or agents etc. must be fully aware of the environmental management requirements detailed in this CEMP. 4) The IPP Contractor and ECO must be informed immediately should environmental issues arise. 5) A copy of the Scoping Report, CEMP and ECC must be present at the construction site for easy reference to all requirements.	No avoidable environmental impacts occurring due to miscommunication. The ECO is aware of decisions taken by the engineer and contractors.	ECO, IPP Contractor and Contractor.	During the construction phase (from site establishment to contract completion).	Project Proponent and ECO
2.	Training of workers	Without proper training the health and safety of workers will be at risk and preventable environmental impacts could occur.	Objective: To provide health and safety training to construction workers to ensure a safe working construction site and to ensure that each employee is aware of the environmental impacts that could occur. Mechanism: 1) Promote skills development and training for construction workforce 2) Temporary and permanent construction workers must undergo induction training. The induction training must cover	All employees adhere to the mitigation measures provided in this document. All operators of mechanical equipment are trained properly by the contractor.	Contractor and ECO The Contractor shall supply the ECO with a monthly report indicating the number of employees that will be present on site during the	During the construction phase (from site establishment to contract completion)	MET:DEA and Project Proponent

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>environmental awareness SHE measures and training in safe construction activities in close proximity to substations. All employees who have undergone training shall be issued with identification cards, which are to be worn at all times on site</p> <p>3) Environmental posters and/ or translators can be used for training purposes.</p> <p>4) Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.</p> <p>5) Toolbox talks must be attended throughout the construction period as deemed necessary by the ECO.</p> <p>6) Copies of the attendance registers for all environmental awareness training, complaints registers, penalty registers and method statements must be kept and made available to the Project Proponent and MET:DEA on request.</p> <p>7) Ensure that the training includes all aspects of the General Specifications (Annexure A).</p>	<p>All workers have attended Environmental awareness training and health and safety training.</p>	<p>following month.</p>		
3.	Socio-economic impact	The activity could benefit local communities through job creation, however negative impacts are also possible and must be controlled.	<p>Objective: To promote benefits to local communities whilst preventing negative impacts.</p> <p>Mechanism:</p> <p>1) Quotas for local employment must be set, and the contractor's contract must specify that these positions shall only be filled by non-local persons if it can be demonstrated that no suitable local persons must be identified (e.g. through local advertising) to fill these positions. Follow-up compliance monitoring must be undertaken.</p>	<p>Contribute to employment and capacity building in the local community.</p> <p>Creating awareness amongst employees and the public.</p>	<p>Contractor, IPP Contractor and ECO</p>	<p>During the construction phase (from site establishment to contract completion)</p>	<p>Project Proponent</p>

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			2) Maximise and monitor local recruitment & procurement (incl. using local skills and small-business databases). 3) Promote skills development and training for construction workforce 4) Recruitment shall be at a central office in the nearest town. 5) Maintain a fair and transparent local recruitment policy. 6) A local employment policy must be implemented, audited and accompanied by a training programme. 7) Where possible and environmentally sustainable, use labour-intensive methods of construction. 8) Procurement of materials, goods and services shall be sourced from local suppliers where feasible. 9) Encourage indirect employment creation in the informal sector where feasible. 10) Ensure adequate notification to town council. 11) Implement HIV/AIDS awareness and prevention programme. 12) Maintain control of access to construction sites 13) Restrict unauthorised access to the construction site. 14) Maintain clear identification of construction workers 15) Liaise with local crime control programmes & police. 16) Ensure adequate facilities (waste disposal, ablutions) on site. 17) Strictly enforce rules of conduct with regard to sanitation, water and waste management				

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>on site as stipulated in the EMP.</p> <p>18) Implement fire safety and firefighting strategy.</p> <p>19) The site must be secured.</p> <p>20) Implement a policy of “no employment at the gate” to prevent loitering.</p> <p>21) Tender criteria must require training and skills development of the contractor workforce by the contractor. Where possible, training must be aimed at providing skills to employees that might allow them to apply for permanent positions during the operation of the facilities.</p> <p>22) The IPP Contractor must engage with relevant regional and constituency committees to set up a database for skills and small businesses. The database will facilitate local employment and procurement of resources; it must be set up before the construction contractor has been appointed.</p> <p>23) Investigate opportunities that encourage indirect employment creation in the informal sector. This can be done in-house by the IPP or through a specialist consultant. Should food stalls be allowed, institute periodic health and safety inspections on them.</p> <p>24) If feasible, labour-based methods of construction must be used.</p> <p>25) Appoint Community Liaison Officers to work together with the ECO and to ensure communication, and prompt addressing of problems.</p> <p>26) Compile and implement a SHE plan is implemented accordingly.</p>				
4.	Heritage	Heritage resources	Objective: To ensure that no potential buried	No heritage	Project Proponent,	During the	Project

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
	resources	can be impacted on during the site clearance, earthworks and the construction of the facility.	<p>heritage resources are disturbed and or destroyed.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) Artefacts are defined as 'the remains of human habitation or occupation over 50 years old' and are protected. Items include, but are not limited to, stone objects, pottery, iron or copper objects, ornaments, bone fragments, ostrich egg fragments, graves, foundations of huts as well as more recent domestic or military items from the colonial period. Should any artefacts be exposed during excavation, work on the area where these artefacts are found must cease immediately and the ECO notified accordingly. 2) Conduct a site induction and awareness of known sensitive sites for all personnel and contractors. 3) Cease work immediately upon discovery of heritage material. 4) Report findings immediately and mark exclusion boundary. 5) Adopt "chance finds" procedure as follows: Action by person identifying archaeological or heritage material <ul style="list-style-type: none"> • If operating machinery or equipment stop work • Identify the site with flag tape • Determine GPS position if possible • Report findings to foreman <p>Action by foreman</p>	resources are disturbed or destroyed and NHC are contacted in the event of uncovering an artefact.	ECO, and Contractor	construction phase (from site establishment to contract completion)	Proponent

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<ul style="list-style-type: none"> • Report findings, site location and actions taken to superintendent • Cease any works in immediate vicinity <p>Action by superintendent</p> <ul style="list-style-type: none"> • Visit site and determine whether work can proceed without damage to findings • Determine and mark exclusion boundary • Site location and details to be added to GIS for field confirmation by archaeologist • Action by archaeologist • Inspect site and confirm addition to GIS • Advise NHC and request written permission to remove findings from work area • Recovery, packaging and labelling of findings for transfer to National Museum <p>In the event of discovering human remains</p> <ul style="list-style-type: none"> • Actions as above • Field inspection by archaeologist to confirm that remains are human • Advise and liaise with NHC and Police • Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed <p>6) Sites considered to be at high risk encountered during site work must be recommended for excavation.</p> <p>7) Integrate an archaeological database into the project management GIS.</p> <p>8) Cease work immediately upon discovery of heritage material.</p> <p>9) Report findings immediately and mark exclusion boundary.</p>				

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>10) The Project Proponent shall then appoint an archaeologist to examine the findings.</p> <p>11) Recovery of remains discovered and their removal must be directed by the National Museum (+264 61 276800) or National Forensic Laboratory (+264 61 240461).</p> <p>12) No artefacts must be removed or be interfered with prior to authorisation from the Namibian National Heritage Council (NHC).</p> <p>13) Mitigation must involve the scientific recording or collection of artefacts.</p>				
5.	Protection of fauna and flora	<p>Constructing the facility may have impacts on the fauna and flora.</p> <p>Additional pylon infrastructure to the substation areas is expected to be detrimental to larger avian species – i.e. potentially increase collision rates.</p> <p>Destruction of vertebrate fauna.</p> <p>Destruction of unique flora and special habitats</p>	<p>Objective: To prevent unnecessary disturbance to natural flora and fauna.</p> <p>Mechanism:</p> <p>1) Employ a qualified environmental officer during the construction phase to ensure the appropriate management of the wildlife and ecological processes.</p> <p>2) Implement and maintain speed control with maximum speed limits (e.g. 40km/h). Temporary speed humps could also be used to limit the speed at which people travel but care must be taken to ensure these do not cause erosion.</p> <p>3) Avoid off-road driving and unnecessary nocturnal driving in the area.</p> <p>4) Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g. tortoises, etc.), indiscriminate killing of perceived dangerous species (e.g. snakes, etc.) and the collection of wood in and surrounding the project area.</p>	<p>No animals are injured.</p> <p>No setting of snares</p> <p>No employees enter the no-go areas.</p> <p>No alien vegetation establishment.</p> <p>Implement speed limits and temporary speed humps.</p> <p>No off-road driving</p> <p>No setting of fires</p> <p>Establish an appropriate refuse removal policy.</p>	ECO, Contractor,	During the construction phase (from site establishment to contract completion)	ECO

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>5) Initiate a policy of capture, removal and relocation of fauna (e.g. slow moving species such as tortoises and chameleon) encountered serendipitously within the construction areas. Such fauna must be relocated to areas of similar habitat within 1-2 km of the site.</p> <p>6) Initiate a suitable and appropriate refuse removal policy.</p> <p>7) Prevent and discourage fires.</p> <p>8) Do not allow domestic pets – e.g. cats and dogs – to accompany the workers on site during the construction phase.</p> <p>9) Educate/inform contractors on dangerous and protected species to avoid and the consequences of illegal collection of such species.</p> <p>10) Identify (e.g. mark – red and white tape) protected and unique species (i.e. <i>Acacia erioloba</i>, <i>Albizia anthelmintica</i>, <i>Boscia albitrunca</i>, <i>B. foetida</i>, <i>Faidherbia albida</i>, <i>Parkinsonia africana</i>, <i>Ziziphus mucronata</i> [Forestry Ordinance No. 37 of 1952]) before the commencement of construction activities. These species must be avoided if possible, or a permit must be applied for, for the removal thereof.</p> <p>11) Avoid the removal of bigger trees (especially protected species – i.e. <i>Acacia erioloba</i>, <i>Boscia albitrunca</i>, <i>B. foetida</i>, <i>Euclea pseudebenus</i> and <i>Tamarix usneoides</i> [Forestry Ordinance No. 37 of 1952] – during the construction phase(s) – including the</p>	<p>No domestic pests on site</p> <p>No collection of wood on site.</p> <p>Identify and mark protected and unique or big plant species to be avoided or removed with permits.</p> <p>No planting of alien plants on site.</p>			

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>development of access routes and other infrastructure developments.</p> <p>12) Prevent planting of potentially alien invasive plant species (e.g. <i>Tecoma stans</i>, <i>Pennisetum setaceum</i>) for ornamental purposes.</p> <p>13) Ensure removal and control of existing invasive alien plant species (i.e. <i>Prosopis</i> sp.) on site and within the surrounding 6 m wide fire break.</p> <p>14) Prohibit the removal of unique and restricted range flora (e.g. all Aloe species encountered prior to and during construction) within the proposed construction areas. Such flora must be removed under supervision of a suitably qualified person (e.g. a botanist) and moved to other areas of similar habitat in the area or stored (cared for in onsite nursery conditions) and replanted as part of the overall natural landscaping.</p> <p>15) Liaise with National Botanical Garden with regards to Search and Rescue efforts as well as donation of rescued plants.</p> <p>16) Avoid the use of herbicides; instead use manual cutting/pruning/clearing of vegetation in the most important areas. Also, a grazing strategy with indigenous sheep should be implemented. Should the grazing strategy be unsuccessful or should the farmer not graze with sheep, herbicides could be considered, provided input is sought from an ecologist.</p> <p>17) Do not clear cut the area but rather only clear the tree/shrubs hampering development</p>				

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>activities.</p> <p>18) Maintain a 6 m wide firebreak around the perimeter of the site. Domestic stock could also be used to ensure this.</p> <p>19) Should any small fauna be encountered during site clearance, they must be relocated to the land north of the site adjacent to the ephemeral watercourse.</p> <p>20) Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the site boundary.</p> <p>21) Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. Disposal of cleared alien vegetation must be to a licenced landfill site.</p> <p>22) Normal agricultural activities must continue in unaffected areas.</p> <p>23) Land rehabilitation and re-vegetation must commence immediately upon completion of construction.</p>				
6.	Stormwater runoff, erosion, and pollution of surface water and groundwater resources	Contamination of stormwater runoff can impact on the surface and groundwater resources. The mismanagement of stormwater can furthermore result	<p>Objective: Prevent stormwater from eroding the land and becoming contaminated.</p> <p>Mechanism:</p> <p>1) Maintain a buffer of 100 m adjacent to identified watercourse.</p> <p>2) Should construction activities for the proposed infrastructure need to take place within the drainage features (i.e. linear</p>	<p>Stormwater not contaminated by construction activities.</p> <p>Stormwater control measures are effective at regulating runoff</p>	<p>ECO and IPP Contractor</p> <p>ECO to inspect soils for erosion at regular intervals.</p>	<p>After site clearing has taken place up to the end of the construction phase</p> <p>Monitoring for alien plant</p>	ECO

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
		in erosion.	<p>development including roads and transmission lines) this must transect the streams at right angles and be limited as far as possible to ensure minimum disturbance of such areas.</p> <p>3) Demarcate a 100 m no-go zone from ephemeral watercourses during construction to prevent construction activities from occurring near the ephemeral watercourses to prevent further loss of vegetation, erosion and watercourse sedimentation.</p> <p>4) Any disturbed areas must be rehabilitated as soon as possible after construction has been completed and re-vegetated with suitable indigenous vegetation.</p> <p>5) Conduct a visual monitoring exercise of disturbed areas for invasive alien plants and erosion every three months. Remove any regrowth of invasive alien plants.</p> <p>6) Contaminated runoff from the construction site must be prevented from entering the watercourse, measures include oil and grease traps, cleaning up spills immediately and proper disposal of contaminated material.</p> <p>7) Construction workers must be given ablution facilities at the construction site as specified in CEMP. These facilities must be located at least 100m away from streams or freshwater systems and regularly serviced as per the manufacturer's specifications.</p> <p>8) Rubble, sand and waste material resulting from the construction activities must be cleared up but not disposed in any stream or drainage channels as it will impede on the</p>	<p>from the site and erosion channels do not develop.</p> <p>Freshwater ecosystems are not unduly disturbed by construction activities within the drainage channels.</p>		<p>species and erosion every three months</p> <p>Monitor and record groundwater abstraction and groundwater levels (monthly) and submit recordings to MAWF.</p>	

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>flow in these channels.</p> <p>9) The abstraction of groundwater must be properly controlled within a prescribed water demand management plan and as required by the licence conditions.</p> <p>10) A critical groundwater level must be determined and the groundwater table must be maintained above such critical levels during water abstraction periods.</p>				
7.	Visual impact	Although the visual resources of the area is degraded, the additional PV facility could contribute to negative visual impacts that could result in a reduction in tourism and detract from the sense of place.	<p>Objective: Limit dust caused by materials haulage to and from the site, site development works</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) Do not use 15 m tracking PV type structures. 2) Do not exceed 7 m for PV structure height. 3) Maintain a 50 m No-go buffer from the road in current and future expansion phases. 4) Keep access roads clear and implement measures to minimise dust from construction traffic on gravel roads. 5) If site clearing is required,, the topsoil must be removed and conserved for use in rehabilitation. The remainder could be used for site development, and any surplus disposed of in a manner that appears natural. 6) Remove all litter and no contaminants shall be allowed to enter the environment by any means. 7) Rehabilitation of all impacted areas must commence during the construction phase and continue until the state of the vegetation meets the requirements of the ecological 	No complaints from the public.	ECO, IPP Contractor and Contractor	During the construction phase (from site establishment to contract completion)	ECO

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			assessment and is satisfactory to the ECO.				
8.	Traffic	Increased volume of traffic both on and off site	<p>Objective: To ensure that increased traffic volume is managed efficiently to minimise associated impacts.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) Access road entrances must be demarcated, both at their exit point from existing roads and the entry point to the site. 2) Erect signage to warn motorists about construction activities and heavy vehicle movement where appropriate. 3) Implement General Specifications (Annexure A). 	Traffic is orderly, free flowing and controlled.	IPP Contractor and Contractor	During the construction phase (from site establishment to contract completion)	ECO
9.	Dust	Dust generated from materials handling, roads and stockpiles can become a nuisance to neighbouring landowners.	<p>Objective: To avoid nuisance impacts caused by dust as far as possible.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) All reasonable measures shall be taken to minimise the generation of dust as a result of construction activities. If dust will be experienced as a nuisance by nearby residents/businesses, then dust suppression measures shall be implemented on site. In order to conserve water, dust suppression using water is not recommended, instead chemical dust suppressants such as 'Dustex', may also be used provided they are used in the manner prescribed and away from the drainage lines on site. 2) Implement measures identified in the General Specifications (Annexure A). 	No complaints received from public and or site staff.	Contractor and ECO	During the construction phase (from site establishment to contract completion)	ECO
10.	Noise	The increase in traffic and	<p>Objective: To ensure that noise from the construction activities do not exceed unacceptable</p>	No complaints received from public and or site staff.	Contractor and ECO	During the construction phase (from site	ECO

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
		operation of equipment may result in noise becoming a nuisance.	levels. Mechanism: 1) Implement General Specifications (Annexure A). 2) Construction activities are to be restricted to the hours of 08:00 to 17:00 on weekdays and 08:00 to 14:00 Saturdays with no work permitted at night, on Sundays, or on public holidays. 3) If the contractor needs to undertake activities outside the hours above, the residential and community receptors within audible range of the activity must be notified within 24 hours in advance of the planned activity.			establishment to contract completion)	
11.	Hazardous substances	Impact on soil and water.	Objective: Secure safety, to avoid soil and water contamination Mechanism: 1) Implement measures identified in the General Specifications (Annexure A).	Correct handling, use and storage of materials, including hazardous materials. MSDS are available for all hazardous substances stored on site. Appropriate hazardous waste spill kits are available on site.	Contractor monitored by the ECO	During Construction Phase (from site establishment to Contract Completion).	ECO
12.	Solid waste management	The incorrect management of solid waste can result in the pollution of soil, groundwater and	Objective: To avoid soil and water contamination as well as windblown litter. Mechanism: 1) Implement General Specifications (Annexure A).	No complaints from public. No windblown litter. No contamination of	Contractor, ECO	During the construction phase (from site establishment to contract completion).	ECO

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
		the general environment. Windblown litter can also contribute to a negative visual impact.		soil and or water. Certificate of disposal at approved waste site are available			

Table 5: CEMP: Establishment of the working area

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
1.	Demarcate the construction site	Without properly demarcating the site, the public would be able to access the site and would be at risk. The surrounding vegetation and watercourse might also be impacted by the activities.	Objective: Prevent construction activities from impacting on surrounding areas and people. Mechanism: 1) The site is to be fenced off in such a manner that unlawful entry is prevented. 2) Signage shall be placed at all access points in compliance with all applicable occupational health and safety requirements.	Temporary or permanent fencing in place.	Contractor	Prior to the commencement of site clearance.	ECO, IPP Contractor
2.	Stockpiling of equipment and materials	Incorrect storing of materials can result in water and soil contamination, dust and or erosion. Incorrect storage and handling of materials also pose a risk of environmental	Objective: Ensure that all materials and equipment handled and stored in a manner that environmental contamination and safety hazards are limited. Mechanism: 1) The IPP Contractor shall be advised by the Contractor of the housekeeping arrangements including areas intended for the stockpiling of materials. 2) Implement General Specifications	No public complaints or water/ soil contamination Correct handling, use and storage of materials, including hazardous materials. No incidents of	Contractor and ECO	During Construction Phase (from site establishment to Contract Completion)	ECO, IPP Contractor, Contractor

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
		contamination and could jeopardise the safety of public / site staff.	(Annexure A).	environmental contamination. No accidents or incidents related to the handling of materials. No public complaints.			
3.	Ablution facility	The lack of adequate ablution facilities and recess areas can compromise the health of site staff and result in environmental degradation.	Objective: To minimise the potential environmental impacts associated with workers on the site. Mechanism: 1) Implement General Specifications (Annexure A)	Adequate ablution facilities are in place.	IPP Contractor, and ECO	Prior to construction.	ECO, IPP Contractor, Contractor.

Table 6: CEMP: Clearance of the site and bulk earthworks

	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
1.	Demarcating the area to be cleared	There may be unnecessary environmental impacts outside the site footprint if the area is not demarcated.	Objective: To keep the site area to a minimum to avoid unnecessary impacts to the surrounding environment. Mechanism: 1) The site must be clearly demarcated with fencing or orange construction barrier to keep clearing activities to a minimum. 2) No site staff must be allowed in the area outside of the demarcated area to prevent	Only the area required for the development is cleared.	Contractor and ECO	Prior to construction	ECO

	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			trampling of surrounding vegetation.				
2.	No-Go areas (Those areas which have been designated by the EAP as sensitive environments).	Without No-Go areas the free moving of site staff could result in impacts to sensitive areas.	Objective: To keep the site area to a minimum and to protect sensitive environmental areas. Mechanism: 1) Implement General Specifications (Annexure A).	Comprehensive record, including photographic record, of compliance available.	IPP Contractor and ECO	During Construction Phase (from site establishment to Contract Completion)	ECO
3.	Removal of vegetation	If the removal of vegetation is done incorrectly it may leave the site prone to erosion and compromise rehabilitation requirements post construction.	Objective: To ensure that the site is not prone to erosion and any disturbed areas can be rehabilitated as necessary post-construction. Mechanism: 1) Implement General Specifications (Annexure A).	Topsoil conserved in stockpiles for later use if necessary.	Contractor and ECO	During the start of the construction period	ECO
4.	Excavations for bulk earthworks	Created embankments (cut and fill) and retaining walls are required to level and stabilise the site. Excavations are also required to accommodate bulk services which might impact on the environment.	Objective: To limit the impact to the environment caused by excavations. Mechanism: 1) Implement General Specifications (Annexure A).	No heaps of materials left on site after the construction phase.	Contractor, ECO	During Construction Phase (from site establishment to Contract Completion)	ECO

Table 7: CEMP: Removal of construction related debris, material or equipment

	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
1.	Removal of equipment, materials and any temporary structures	If the construction site is not decommissioned it can result in environmental degradation.	<p>Objective: To leave the impacted area in an acceptable state.</p> <p>Mechanism:</p> <p>1) Implement General Specifications (Annexure A).</p>	The area impacted by the construction activities pose no threat to the environment.	IPP Contractor, ECO	After the construction phase, before the operational phase can commence.	ECO

4.4 PENALTIES

The Project Proponent may include a list of penalties and the magnitude of such penalties into the Contract with the IPP Contractor. Such penalties may be issued per incident at the discretion of the Project Proponent in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications. The Project Proponent will inform the IPP Contractor of the contravention and the amount of the penalty, and will deduct the amount from monies due under the Contract. A penalty register shall be kept and shall be made available to the MET:DEA on request.

It should however be noted that the nature of the activities associated with the project, even with the best of intentions, will inevitably cause some form of environmental degradation. The costs of having to make good on such environmental degradation is usually sufficient punishment without the need to look to other punitive measures. The implementation of a penalty system therefore requires careful consideration:

- Penalties would typically be warranted by persistent negligence on the part of the IPP Contractor or failure to respond adequately to environmental considerations;
- Removal from site would typically be warranted where a particular staff member or piece of equipment is the cause of persistent environmental damage following previous warnings; and
- Suspension of the Works would only be warranted under rare circumstances, and then only with NamPower's approval, where the IPP Contractor's actions have caused or are likely to cause significant environmental degradation.

The type and extent of the corrective measures required to address non-compliance would depend on the nature of the transgression and the IPP Contractor's history in terms of compliance with their environmental obligations. When deciding on the nature of any punitive actions, however, it is important to recognise that the effective implementation of the Construction EMP is highly dependent on the quality of the working relationships that develop between the key role-players. Accordingly, an excessive response to non-compliance, particularly for a minor or unintentional transgression, may cause significant environmental degradation in the long term due to its effect in eroding the IPP Contractor commitment to meeting their environmental responsibilities. Moreover, other mechanisms, such as an expanded environmental induction programme, may prove more effective than purely punitive measures in controlling non-compliance in the long-term. This is an important consideration that must be borne in mind by the Project Proponent and IPP Contractor when responding to non-compliance.

Should a penalty system be implemented it is suggested that penalties range from N\$1 000 to N\$10 000, depending on the degree of severity of the transgression. For each subsequent similar offence the penalty could be doubled in value to a suggested maximum value of N\$50 000.

4.5 AMENDMENT TO THE CEMP

Amendments and the reasons therefore must be agreed to by both the Project Proponent and IPP Contractor and recorded in the CEMP as a “paper trail”. Amendments to the CEMP must be submitted to MET:DEA.

5 OPERATIONAL FRAMEWORK EMP

This section contains the Operational Framework EMP. It is important to note that this Framework OEMP has been compiled prior to authorisation of the proposed project and will be updated to include any conditions of the approval that will be issued by MET:DEA as part of the ECC.

The information is summarised in Table 8 below illustrating the aspect, impact, mitigation measure, performance indicators, responsibility, schedule and verification. These criteria are listed and explained below:

Definitions:

The following components are identified/ described:

- Activity: component / activity of the project for which the impact has been identified;
- Aspect: the aspect of the above activity which will be impacted;
- Impact: the environmental impact identified and to be mitigated;
- Mitigation measure: measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact – mitigation is divided into the following:
 - Objective: desired outcome of mitigation measure,
 - Mechanism: method of achieving the objective;
- Performance indicators: outcomes that will indicate achievement of objective/s;
- Responsibility: party or parties identified for implementation of mitigation measure/s;
- Resources: available resources to aid implementation of mitigation;
- Schedule: timeframe in which identified impact and mitigation measure is anticipated to occur; and
- Verification: party or parties identified as responsible for review and assessment of final outcome.

The duties of the responsible personnel during the operational phase should be similar to those suggested for the construction phase (see Annexure B) but will ultimately be identified and defined by the Project Proponent.

Table 8: OEMP: OPERATIONAL SPECIFICATIONS

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
1.	Environmental management documentation and procedures	No framework within which to locate the management of the operational phase. No procedures against which to assess environmental performance during the operational phase and thus no measure of compliance.	Objective: To ensure that the operation of the facility does not result in avoidable impacts on the environment, and that any impacts that do occur are anticipated and managed. Mechanism: 1) Appoint a suitably qualified, independent ECO to monitor compliance and compile an environmental audit report . 2) Audit the compliance with the requirements of the environmental specification contained within the OEMP.	Environmental impacts effectively monitored and managed during the operational phase. Comprehensive record of compliance and remedial actions available to the developer and the authorities	Project Proponent and IPP Contractor	Twice in the 1 st three years and then once every five years	Project Proponent
2.	Socio-economic impact	Positive impacts on socio-economic environment during operation	Objective: To ensure that the operation of the facility maximises positive impacts on the socio-economic environment. Mechanism: 1) Procurement of materials, goods and services must be from local suppliers, where possible. 2) Employ local labour for the operational phase, where possible, and particularly for day to day operations and maintenance. 3) The contractor must be required to employ skilled or semi-skilled local labour (depending on their capacity to operate the facility). The requirement to employ local labour must be incorporated in the contractor's contract. Follow-up compliance monitoring shall be undertaken. 4) Where possible encourage the use of local	Record skills and trainings, employment records and proof of staff residency in the area prior to employment.	IPP Contractor	During the operational phase	IPP Contractor

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>suppliers for procurement of goods, materials and services.</p> <p>5) Implement training and capacity building programmes to enhance the ability of local community members to take advantage of available employment opportunities.</p>				
3.	Protection of ecology	<p>During the rehabilitation of vegetation during operation or during maintenance activities the site could become prone to invasion by alien species.</p> <p>Destruction of vertebrate fauna (e.g roadkills; fence and pylon mortalities).</p>	<p>Objective: To prevent unnecessary disturbance to natural vegetation and fauna.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) Any alien plants within the site footprint must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. 2) Ensure removal and control of existing invasive alien plant species (i.e. <i>Prosopis</i> sp.) onsite and within the surrounding 6 m wide fire break. 3) Maintain track discipline with maximum speed limits (e.g. 40km/h). Temporary speed humps could also be used to limit the speed at which people travel but care must be taken to ensure these do not cause erosion. 4) Avoid off-road driving and unnecessary nocturnal driving in the area. 5) Remove all refuse on site. 6) Maintain coils/flappers on new pylon routes longer than 100m to increase visibility and prevent further bird mortalities. 7) If nesting on pylon structures becomes problematic, "dummy poles" could be erected for species such as sociable weaver to avoid 	<p>No alien vegetation establishment.</p> <p>No road, pylon or electric fence mortalities.</p>	IPP Contractor	During the operational phase	Project Proponent

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>this problem.</p> <p>8) Initiate land rehabilitation and re-vegetation as soon as possible and continue to monitor land for early signs of degradation and erosion.</p> <p>9) Re-vegetate with more palatable plant species to enable faster stocking initiation.</p> <p>10) Allow sheep (indigenous breed e.g. Damara and Gellaper) to graze and browse the site periodically during/after growth season (November – March to control vegetation in solar site instead of herbicides. Proper veld management should be encouraged based on the rainfall, regrowth and numbers of sheep. It is advised that the area be rested for at least two seasons after construction to allow the perennial grasses to re-establish before grazing commences. A heavy grazing regime during or after the growth season (between November and March) should keep grass short throughout. Should grazing be unsuccessful, or should the landowner not farm sheep, the use of herbicide could be considered and investigated by an ecologist. Application procedures should cover at least the application frequency, quantity and type of herbicide to use..</p> <p>11) Prevent and discourage setting of fires as this could easily cause runaway veld fires.</p> <p>12) Do not allow domestic pets – e.g. cats and dogs to accompanying employees onsite.</p> <p>13) Prevent and discourage the collection of firewood in and surrounding the project area.</p>				

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
			<p>14) Maintain transformer covers to ensure that no owls, genet or other animals are nesting on the transformers.</p> <p>15) Ensure that solar panels are cleaned regularly and kept free of bird streamers.</p>				
4.	Stormwater runoff, erosion, and pollution of surface water and groundwater resources.	Contamination of stormwater runoff can impact on the surface and groundwater resources. The mismanagement of stormwater can furthermore result in erosion.	<p>Objective: Prevent stormwater from eroding the land and becoming contaminated.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) The areas likely to contribute to contaminated runoff, such as the workshop must be designed to have hardened surfaces equipped with oil and grease traps to capture any contaminated runoff. These must be maintained during operation. 2) Should storm water infrastructure be required, a management plan must be in place to ensure as a minimum that the structures are visually monitored after large rainfall events to ensure that eroded areas do not develop. 3) Stormwater runoff from the constructed areas must be monitored to ensure that eroded areas do not develop, particularly near the outlets. 4) Any refuse generated must be disposed of in suitable bins and removed from site at regular intervals. 5) Maintain the groundwater table above critical groundwater levels during water abstraction periods. 6) Ensure proper groundwater abstraction management 	<p>Stormwater not contaminated by construction activities.</p> <p>Stormwater control measures are effective at regulating runoff from the site and erosion channels do not develop.</p> <p>Groundwater water usage as per water licence.</p>	IPP Contractor	<p>During the operational phase</p> <p>Measure water levels in the surrounding boreholes (within the 5 km radius) once a year</p> <p>Monthly monitoring of groundwater level fluctuations on site - submit the recorded groundwater levels to MAWF for processing and evaluation.</p>	Project Proponent
5.	Visual impact	Visual resources	Objective: To protect the sense of place.	No complaints from	IPP Contractor	During the	Project

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	SUGGESTED RESPONSIBILITY	SCHEDULE	SUGGESTED VERIFICATION
		surrounding the area are visually degraded. However, the undulating terrain and thick bush vegetation increases the scenic quality of the site.	Mechanism: <ol style="list-style-type: none"> 1) Keep access roads clear 2) Keep all lighting minimal, within the requirements of safety and efficiency. 3) Where such lighting is deemed necessary, use shielded low-level lighting to reduce light spillage and pollution. 4) Avoid naked light sources that are directly visible from a distance. Only reflected light must be visible from outside the site. 5) Rehabilitation of all impacted areas must continue until the state of the vegetation meets the requirements of the ecological assessment and is satisfactory to the Environmental Control Officer. 	the public.		operational phase	Proponent
6.	Noise impact	The increase in traffic and operation of equipment may result in noise becoming a nuisance.	Objective: To ensure that noise from the operational activities does not exceed unacceptable levels. Mechanism: <ol style="list-style-type: none"> 1) All plant, equipment and vehicles must be kept in good repair. 2) When ordering plant and machinery, manufacturers must be requested to provide details of the sound power level. Where possible, those with the lowest sound power level (most quiet) must be selected. 	No complaints from the public.	IPP Contractor	During the operational phase	Project Proponent

6 MONITORING PROGRAMMES

The success of implementation of the OEMP can be judged by monitoring the compliance of actions on site with the specifications as outlined in the EMP. Specific indicators have been identified which if monitored will ensure that the project is socially and ecologically sustainable throughout the operational phase of the development.

The purpose of monitoring is to follow changes over a period of time and to assess the efficiency of control measures, through a process of repetitive and continued observation, measurement and evaluation of environmental data. Checklists are the most widely used monitoring tools, however other monitoring tools include electronic decision support instruments, online digital monitoring instruments and photographic records of the site.

Checklists and monitoring reports for environmental monitoring should be kept by the individual responsible for environmental management and should be stored in a suitable information system. The checklists and reports must be available for use when auditing of the project is undertaken. The person conducting the monitoring must ensure that the environmental monitoring report or checklist is accurately completed, the observations made during the monitoring are correct and a true reflection of the actual situation and that the interpretation of the data is logical and factual.

A monitoring report is not a detailed report, as much of the monitoring information will be contained in the completed checklists. The monitoring report must contain the following:

- The date/s that the monitoring was conducted
- The type and objective of the monitoring
- How the information on the checklist was obtained
- Who performed the monitoring
- Which checklists were used
- Any problems encountered during the monitoring process

The monitoring report must include the key findings and recommendations made by the appointed monitor and must include a summary of the compliance or non-compliance of management actions on site. A more detailed description of the important monitoring results should then be compiled. The report should also include a physical description of the site, the indicators (if relevant) and monitoring sites. The type of information that will be included in the report is dependent on the type of monitoring that is required for the specific purpose. Diagrams, photographs, and other data may also form part of the report.

The report must recommend any corrective actions to assist in attaining compliance with a performance indicator or standard. Corrective actions will vary widely and must be determined by the person with the delegated powers to institute change.

Instituting corrective action to resolve non-compliance in the monitoring process is more immediate than the auditing process, as all non-compliance issues will need to be corrected immediately. The corrective action will be specific to each impact and may need the input from all parties working on the project and independent advice may be required to find solutions. The

information in the non-compliance report will need to be followed up to ensure that the corrective actions have been completed.

All monitoring results must form part of the audit process. This is a review of the monitoring systems to determine if they have been effective in achieving the desired goals. Based on the results of the audit, it may be necessary to amend or update aspects of the OEMP and the monitoring programme. It may be necessary to update the monitoring programme as additional information is obtained during the construction and operation of the facility.

Monitoring for and during the decommissioning phase must form part of the detailed Decommissioning Phase EMP.

The specific monitoring requirements in Table 9 must be undertaken by a suitably qualified person.

Table 9: Monitoring Programmes

NO	ASPECT	PHASE	WHAT TO MONITOR	STANDARD TO ACHIEVE	MONITORING FREQUENCY	SUGGESTED RESPONSIBILITY	SUGGESTED REPORTING
1.	Access roads	Construction and operation	Generation of mud on access roads after heavy rainfall event	Roads in a well maintained condition no damage to vehicles	After heavy rainfall event	ECO / contractor	Action in Environmental Incident Register to be included in the monthly report
2.	Dust	Construction	Dust and ensuring its suppression during construction of infrastructure	Meet the standard for the South African Atmospheric Pollution Prevention Act ² .	Daily during the construction phase	ECO / contractor	Monitoring actions and data in Environmental Incident Register to be included in the monthly report
3.	Erosion	Construction and operation	Area (m ²) affected by erosion Effectiveness of erosion control measures (improvement over time)	No incidences of erosion occurring Should erosion occur, successful remediation of erosion, so that areas are rehabilitated	Contractor to inspect daily and after a significant rainfall event (construction phase). Monthly inspections during operational phase to occur at the same time as rehabilitation monitoring visits	IPP Contractor / ECO	Monitoring actions and data in Environmental Incident Register to be included in the monthly report
4.	Pollution	Construction and operation	1) Public involvement/complaints 2) Health and safety incidents 3) Non-compliance incidents 4) Accuracy of register of substances in the hazardous substances store 5) Integrity of the bund wall 6) Security of the door to the store	No incidences of pollution Zero pollution incidences	As incidents occur Fortnightly and after every event logged	Project Proponent, Contractor, and IPP Contractor	Environmental Incident Register to be included in the monthly report Hazardous substances inspection checklist to be included in the Environmental Incident Register to be included in the monthly report

² Namibia's Atmospheric Pollution Prevention Ordinance No. 11 of 1976 has not included compliance to any ambient air standards and has instead adopted the South African Atmospheric Pollution Prevention Act (No. 45 of 1965). As such relevant South African control measures pertaining to air quality and dust control as well as international best practice standards in this regard shall apply.

NO	ASPECT	PHASE	WHAT TO MONITOR	STANDARD TO ACHIEVE	MONITORING FREQUENCY	SUGGESTED RESPONSIBILITY	SUGGESTED REPORTING
			7) Integrity of all containers within the store 8) MSDS documents 9) The correct storage of fuels, oils and lubricants within the workshop. 10) Any pollution incidences				
5.	Pollution safety	Construction and operation	1) Integrity of impervious floor layer of fuel storage and dispensing areas 2) Integrity of bund walls 3) The storage and dispensing areas are secure when not in use, e.g. over-night. 4) Clean up kits for accidental spills are available and 100% complete in terms of their contents 5) Any pollution or safety incidences	Zero pollution incidences	Fortnightly or more frequently if required (after each event)	Contractor / ECO	Fuel checklist to be included in the Environmental Incident Register in the monthly report
6.	Erosion and water pollution	Construction and operation	1) Stormwater system integrity	Zero incidences of significant erosion Zero incidences of pollution events from stormwater	Weekly or after each heavy rainfall event	Contractor	Environmental Incident Register to be included in the monthly report
7.	Waste	Construction and operation	1) Certificates of disposal at authorised waste facilities 2) Incidences of waste management contraventions 3) Distribution and integrity of waste disposal containers 4) Awareness training for staff	Zero waste management infringements Application of responsible waste measures	Daily record Weekly record Monthly Quarterly	Contractor Contractor ECO ECO	Site Diary Environmental Site Inspection Checklist Register for Waste Materials Waste Management Report

NO	ASPECT	PHASE	WHAT TO MONITOR	STANDARD TO ACHIEVE	MONITORING FREQUENCY	SUGGESTED RESPONSIBILITY	SUGGESTED REPORTING
			related to waste matters (proof of workers trained)				
8.	Vegetation and fauna	Construction and operation	<ol style="list-style-type: none"> 1) Incidents of unauthorised entry into no-go areas 2) Erosion (area in m²) 3) Rehabilitation of disturbed areas 4) Occurrence of alien species (type, location and area invested (m²)) 5) Establishment of bird nests on pylons and transformers as well as beneath solar panels. 	<p>Zero incidents</p> <p>No incidences of erosion occurring</p> <p>Should erosion occur, successful remediation of erosion, so that areas are rehabilitated</p> <p>Measurable targets for this must be determined by the ECO at the commencement of the rehabilitation activities</p> <p>Zero alien species occurring in the footprint area and a 20m buffer area around footprint</p> <p>No incidences of nesting birds (owls, genets and sociable weavers)</p>	<p>Ongoing</p> <p>Alien vegetation monitoring shall occur monthly for 36 months post construction and annually thereafter for next 2 years</p>	IPP Contractor / ECO	Monthly reports to be submitted to Owner and included in annual audit report

7 DECOMMISSIONING

In terms of EMA it is necessary to consider the environmental impacts of decommissioning of any development, however, the PV facility is expected to be operational for a period of 20 years or more. Thereafter, the PV facility could either be decommissioned or upgraded, depending on the feasibility. According to Namibian Legislation, decommissioning is considered as a separate activity which should be dealt with on its own. The decommissioning of the PV facility would therefore be addressed in a new EIA process to be conducted prior to the site being decommissioned. This section makes recommendations that should be considered in the new EIA process prior to decommissioning.

The Project Proponent should develop a closure plan to be updated on an annual basis commencing at least 10 years prior to the envisaged decommissioning. The closure plan should identify the targets and objectives for closure, and will be important in allowing operations to work toward closure objectives. The Project Proponent should commission specialist inputs from time to time to provide direction on the closure plan to ensure the end result is as closely aligned with prevailing best practice as is possible, thereby minimising the risk and potential costs associated with decommissioning phase. The various stakeholders should also be engaged as early on in the closure planning process to ensure their interests are known and catered for from the point of origin. The construction phase EMP could be used as a guideline to facilitate the detailed decommissioning phase EMP.

Specific mitigation measures have been recommended for the decommissioning phase of the project and are listed below. . It should however be noted that these conditions are subject to change.

7.1 RECOMMENDED MITIGATION MEASURES FOR THE DECOMMISSIONING PHASE

7.1.1 Ecology

The following mitigation measures are recommended from an ecological point of view as part of the closure phase:

- Rehabilitate all areas impacted on by the infrastructure
- Remove all construction waste; rip temporary tracks, if feasible, and replace the topsoil.
- Re-introduce indigenous vegetation (especially protected species – i.e. *A. erioloba*, *Albizia anthelmintica*, *B. albitrunca*, *B. foetida*, *Faidherbia albida*, *Parkinsonia africana*, *Ziziphus mucronata*) as part of the rehabilitation process.
- Re-introduce agricultural activities once the vegetation has been rehabilitated and established.
- Monitor and manage invasive alien plants as well as erosion of the site after activities are completed.

7.1.2 Visual

The following mitigation measures are recommended from a visual point of view as part of the closure phase:

- All PV structures, associated structures and fencing must be removed and recycled as far as possible. Where it is not possible to recycle material, the waste shall be disposed of at a registered landfill site.
- Rehabilitate internal roads that cannot be used by the landowner.
- Rehabilitate and restore all impacted footprint areas as per the requirements of the ecological assessment.
- Rehabilitation of all impacted areas must continue until the state of the vegetation meets the requirements of the ecological assessment and is satisfactory to the ECO.

7.1.3 Socio economic

The following mitigation measures are recommended from a socio-economic point of view as part of the closure phase:

- Maximise the use of local labour on decommissioning activities;
- Provide adequate notification to staff and other stakeholders of the pending decommissioning;
- Provide staff with references so that they can pursue work with other companies;
- If feasible, assist staff in finding employment at other operations.

7.1.4 Surface water

The following mitigation measures are recommended for surface water management as part of the closure phase:

- A decommission plan that addresses the removal of the PV facilities and infrastructure post operation phase must be drawn up and approved. The decommissioning plan must address aspects such as monitoring and management of invasive alien plants as well as management of erosion after the activities on the sites are complete.

8 CONCLUSION

The EMP must be regarded as a living document and changes must be made to the EMP as required by project evolution, while retaining the underlying principles and objectives on which the document is based.

The compilation of the EMP has incorporated impacts and mitigation measures from the Scoping Report as well as incorporating principles of best practice in terms of environmental management. The EMP has ensured that the individual EMPs will be able to incorporate mitigation measures based on the project in its entirety as opposed to phase-specific measures.

ANNEXURE A

CONSTRUCTION EMP GENERAL SPECIFICATIONS (COMPREHENSIVE)

ANNEXURE B

EXAMPLE OF AN ORGANISATIONAL STRUCTURE

ANNEXURE C

PROJECT TEAM CV'S