


ENVIRONMENTAL MANAGEMENT PLAN (CONSTRUCTION)

PILOT STUDY FOR WIND MEASUREMENT MAST AT FARM SCHÖNAU NO 126

MARCH 2023



PROJECT INFORMATION

STUDY PHASE	PRELIMINARY
PROJECT TITLE	Hoodia Pilot Wind Measuring Mast
DEVELOPMENT LOCATION	Farm Schonau No. 126, Karasburg (//Karas Region)
COMPETENT AUTHORITY	Ministry of Mines and Energy and the Namibia Civil Aviation Authority
APPROVING AUTHORITY	Ministry of Environment, Forestry and Tourism
PROPONENT	EMESCO Energy Namibia (PTY) Ltd.
DEVELOPER	EMESCO Energy Namibia (PTY) Ltd.
ENVIRONMENTAL ASSESSMENT PRACTITIONER	<p>Urban Green cc P O Box 11929 Klein Windhoek Telephone: +264-61-300 820 Fax: +264-61-401 294 E-mail: urbangreen@iway.na Website: www.urbangreenafrica.net</p> 

EMP REVISION STATUS

Version	Date Approved	Revision Details
V1 – Original Construction EMP	March 2023	
V2		

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LIST OF ACRONYMS

- BID Background Information Document
°C degrees Celsius
DEA Directorate of Environmental Affairs
EAP Environmental Assessment Practitioner
ECC Environmental Clearance Certificate
ECO Environmental Control Officer
i.e. Example
EA Environmental Assessment
EIA Environmental Impact Assessment
EIAR Environmental Impact Assessment Report
EMA Environmental Management Act
EMP Environmental Management Plan
etc. Etcetera
FSR Final Scoping Report
Ha Hectare
MEFT Ministry of Environment, Forestry and Tourism
MME Ministry of Mines and Energy
NCAA Namibia Civil Aviation Authority
No Number
SSE Schonau Solar Energy
ToR Terms of Reference

GLOSSARY

The definitions given below are for explanatory purposes only.

Activity	The physical work that a Proponent proposes to construct, operate, modify, decommission, or abandon or an activity that a Proponent proposes to undertake.
Alien Species	It refers to a non-indigenous plant, animal or micro-organism; or an indigenous plant, animal or micro-organism, translocated or intended to be translocated to a place outside its natural range of nature, that does not normally interbreed with individuals of another kind, including any subspecies cultivar, variety, geographic race, strain, hybrid or geographically separate population.
Audit	Regular inspection and verification of construction activities for implementation of the EMP.
Competent Authority	A body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.
Construction Activity:	A construction activity is any action taken by the Contractor, his subcontractors, suppliers, or personnel during the construction process.
Construction Camp	Refers to all storage stockpiles sites, site offices, container sites, other areas required to undertake construction and rest areas for construction staff or management.
Contaminated Water	Water contaminated by the Contractor's activities, e.g. concrete water, and runoff from plant/personnel wash areas.
Contractor	The principal person or company, including all subcontractors, undertaking the construction of the development as appointed by the Proponent.
Critically Endangered (IUCN)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V of the IUCN Red List Categories and Criteria ¹), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Cumulative Impacts	In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Environment	As defined in the Environmental Assessment Policy and Environmental Management Act - "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic,

¹ Available at http://s3.amazonaws.com/iucnredlist-newcms/staging/public/attachments/3097/redlist_cats_crit_en.pdf

	paleontological or social values”.
Environmental Management Plan (EMP)	A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.
Environmental Site Manager (ESM)	It is a suitably qualified environmental officer appointed by the Contractor who oversees the on-site daily environmental responsibilities of the Contractor.
Evaluation	The process of ascertaining the relative importance/significance of information, in light of people’s values, preference and judgements in order to make a decision.
Hazardous Substance	A substance that, in the reasonable opinion of the Engineer and/or ECO, can have a harmful effect on the environment.
Independent Environmental Officer (IEO)	A suitably qualified professional independent from the Proponent and Contractor who oversees the construction phase and ensure that all environmental specifications and EMP obligations are met during the phase. The IEO will be responsible for the monitoring, reviewing, and verifying of compliance with the EMP by the Contractor.
Mitigate	The implementation of practical measures to reduce adverse impacts.
Monitoring	Regular inspection and verification of construction activities for degree of compliance to the EMP.
No-Go Areas	Areas identified as being environmentally sensitive in some manner and demarcated 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.
Project Engineer	The person(s) who represents the Proponent and are responsible for the technical and contractual implementation of the works to be undertaken by the appointed contractors.
Proponent:	Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment, Forestry & Tourism.
Resident Engineer (RE)	A person who represents the Project Engineer on Site and is responsible for the technical and contractual implementation of the works to be undertaken.
Search and Rescue	The location and removal of specified plant species, without unnecessary damage, and their transfer to a specified location (on-site nursery).

Specification	A technical description of the standards of materials and workmanship that the Contractor is to use in the works to be executed, the performance of the works when completed and the way payment is to be made.
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1 BACKGROUND INFORMATION

This chapter of the EMP provides the necessary background information to the Hoodia Pilot Wind Measurement Mast (i.e. proposed Project) and receiving environment, which would be presented in much detail in an Environmental Scoping Report given that the testing phase awarded (12 months) determines the feasibility of a wind farm at the particular locality.

1.1 PROJECT OVERVIEW

The Project entails the construction and operation of a single temporary guyed tower structure of height of 150m to determine the economic viability and feasibility of harvesting wind energy. This pilot wind measuring tower will be operational for 12 months, during which time wind measurements will be taken and analysed. The wind measuring tower will not have blades as is the case with a standard wind turbine, but will for purpose of measuring wind speeds and frequency be fitted with a small cup anemometer installed at the very top of the mast and then every 20m down to about 40m height above natural ground level. By measuring wind speeds and frequency at the different heights the ideal height for the wind turbines and size of blades are determined. To ensure compliance with civil aviation requirements (NAMCARs Part 139.11.2), the tower will be fitted with red warning aviation lights placed on top and halfway down the tower structure for night visibility and painted aviation red & white for day visibility.

1.1.1 SITE LOCALITY

The proposed Project Site is located in the southern parts of Namibia, in the //Karas Region, approximately 60 km south-west of //Karasburg Town and 50 km north of the Orange River. The Hoodia Pilot Wind Measurement Mast is envisaged on a portion of the commercial farm, Farm Schönau No. 126 (refer to Fig 1.1 for Locality Map). The 200 ha set aside on the farm for this Project is located on a portion within the south-western parts of the mentioned Farm, along the D208, as indicated by Figure 1.1, with the transmission line extending from the solar farm to the Haris Substation. The solar park is planned to be constructed and developed in configuration as indicated by Figure 1.2 below.



Fig. 1.1 – Locality of Farm Schonau No. 126 within Namibia



Fig 1.2 – Site lay-out of Schonau Solar Energy

The solar park consists of a variety of infrastructure, each having a particular purpose from harvesting the sun's energy (i.e. PV panels), ensuring optimal exposure of the PV panels during daylight (i.e. tracking system), stepping-up the voltage (i.e. field transformers), transmitting electricity to the site substation from where the electricity is fed via an overhead transmission line to the Harib Substation (see section 4.3 of the Environmental Scoping Report, March 2022).

The final site layout (not available at the time of drafting this EMP) should be attached to this Report for purpose of reference.

The activities associated with the construction phase are presented in section 4.3.12 of the Environmental Scoping Report, April 2022, which in brief entails –

- Site surveillance and demarcation;
- Site clearance;
- Construction;
- Site rehabilitation; and
- Commissioning.

1.2 THE RECEIVING ENVIRONMENT

1.2.1 THE PHYSICAL ENVIRONMENT

The physical environment is typical of the *Nama Karoo* biome found within the southern parts of Namibia, which directly determines this particular bio-physical environment (see section 5.1 and 5.2 of the Environmental Scoping Report, April 2022).

The landscape is dominated by large, open valleys of gently sloping ground. Farm Schonau is situated on a relatively flat plain at an altitude of 950 m above sea level, with the Orange River to the south and Karasburg to the north-east. The Farm slopes from the north-eastern corner of the Project Site towards the south-eastern corner (refer to Environmental Scoping Report, April 2022, Appendix F – Agricultural Impact Assessment Figure 7 and 8 for topography and slope map). Prominent drainage lines or erosion gullies are absent on the Project Site and flooding and erosion is not envisaged. (refer to Environmental Scoping Report, April 2022, Appendix F – Agricultural Impact Assessment Figure 3).

Limited volumes of groundwater with elevated salt levels are available in the basement rocks of the southern Karas Region.

The harsh climatic conditions of the Nama Karoo severely limited both historical and pre-colonial human settlement and no known archaeological sites appear on the proposed Project Site or in the immediate vicinity of it (refer to Environmental Scoping Report, April 2022, Appendix E – Archaeology Study Report).

1.2.2 THE BIOPHYSICAL ENVIRONMENT

The Project Site is located in the semi-arid Nama Karoo of southern Namibia. Overall flora and fauna diversity and endemism is viewed as “low” to “extremely low”. A detailed description is presented in section 5.2 of the Environmental Scoping Report, April 2022).

The vegetation of the area can be described as *Karas Dwarf Shrubland* and consist of sparse grass and low shrubs. Although this vegetation type is underrepresented in the state protected area network of Namibia, the overall plant diversity in the general area is “low” with an estimated 50-149 species and endemism is very low with only 2-5 species expected from the general area. Refer to section 5.2.1 of the Environmental Scoping Report, April 2022 for a description and plant species lists.

It is estimated that at least 50 reptile, 4 amphibian, 59 mammal, 146 bird species (breeding residents) are known or expected to occur in the general Farm Schönau/Warmbad area of which a high proportion are endemics.

The most important species expected to occur in the Warmbad area is the one endemic species (Rosy-faced Lovebird) and those species classified as critically endangered (White-backed Vulture), endangered (Ludwig’s bustard, Lappet-faced Vulture, Black Harrier, Martial Eagle, Secretary Bird, Booted Eagle, Black Stork), vulnerable (Tawny Eagle and Secretary Bird) and near threatened (Kori Bustard, Verreaux’s Eagle, Peregrine Falcon and Marabou Stork). These can all be classified as pylon sensitive species.

1.2.3 LAND USE AND INFRASTRUCTURE

The general area surrounding the Project Site is predominant agriculture and tourism on freehold land, with some smaller pockets of large-scale and small-scale agriculture on communal land, as well as government and other parastatal uses. The Project Site for the solar park is located on Farm Schonau No. 126, which is zoned for agricultural use. (see section 5.3 of the Environmental Scoping Report, April 2022).

2 THE ENVIRONMENTAL MANAGEMENT PLAN

2.1 PURPOSE OF THE EMP

The purpose of the EMP is to provide specifications for "good environmental practice" in a sensitive environment for application during construction and operation.

As such, the EMP provides specifications that the Proponent and his nominated Contractors must adhere to minimise adverse environmental impacts associated with the construction activities. The Proponent to which authorisation was granted, is ultimately responsible for overall environmental performance.

The guidelines for the execution of an EMP include the following:

- Responsibilities for the environmental performance of the proposed development are delegated to the construction staff;
- Communications channels to report on environmental performance, problems and priorities are in place;
- Monitoring schedules are established to identify potential negative environmental impacts associated with the construction of the proposed development;
- Mitigation measures are implemented to avoid or minimise the identified negative environmental impacts (loss of endemic and endangered vegetation species, loss of endemic and endangered fauna species, soil, archaeological sites and visual impact) as well as to enhance the positive impact on the environment (employment; support of local businesses, conservation efforts); and
- Monitoring programme is developed to track the plans that have been implemented to ensure the effectiveness of the plan.

2.2 SCOPE OF THE EMP

In order to ensure a holistic approach to the management of environmental impacts during the construction works, this EMP sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved, and monitored by the Independent Environmental Officer (IEO) and Resident Engineer (RE).

This EMP intends to guide and manage the construction activities and surrounding areas as they relate to the natural environment. It describes mitigation measures and is prescriptive in identifying specific people or organisations to undertake specific tasks. This document must further be open-ended, requiring regular review and updating via the correct channels for it to effectively guide environmental management of this project.

The provisions of this EMP are binding on the Proponent until the end of project life. Any third party appointed by the Proponent in terms of the design, construction and operation of the project must comply with the conditions of this EMP.

This EMP has been designed to suite the construction activities needs of the proposed development as well as operation, and incorporates the following:

- General civil construction mitigation measures;
- Specific project mitigation measures;
- Construction activities that could impact on the environment;
- Specifications with which the Contractor shall comply to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

The EMP is a dynamic document subject to similar influences and changes as are created by variations to the provisions of the project specification. Any substantial changes shall require the approval from the Independent Environmental Officer (IEO).

2.3 FORMAT OF THE EMP

The EMP consists of four parts:

- **Chapter 1** gives **Background** information on the proposed Project and the receiving environment;
- **Chapter 2** contains a brief **Description** of the EMP, i.e. purpose, scope, format and amendments;
- **Chapter 3** deals with **Compliance Monitoring** stipulating the general requirements, responsibilities of the different role players, financing of environmental control, dispute resolution, and requirements for monitoring; and
- **Chapter 4** details with the **Environmental Specifications** that set out the environmental objectives and targets with which the Contractor/s shall comply.

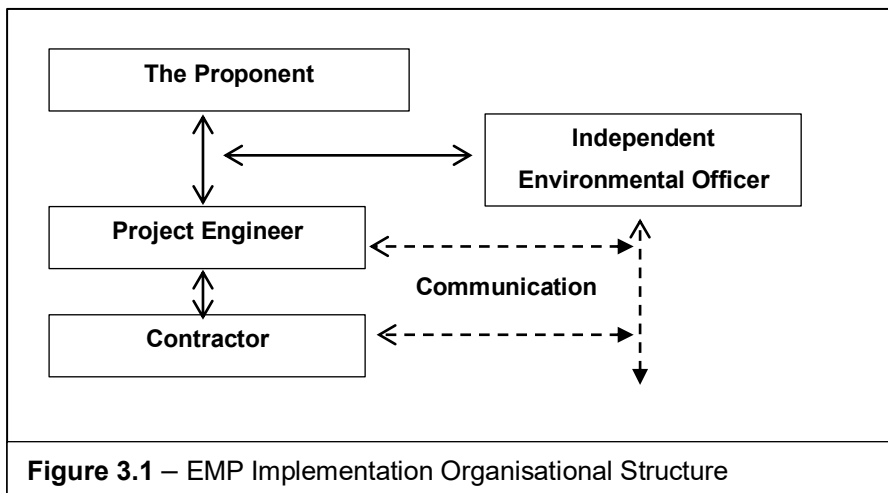
2.4 AMENDMENTS TO THE EMP

Any party involved with the Project can suggest changes to the EMP via the IEO and Engineer. Approved changes will be recorded and drafted into this existing EMP in the form of an appendix or amendments. This should be clearly stipulated in the EMP to avoid confusion.

3 ADMINISTRATION AND REGULATION OF ENVIRONMENTAL OBLIGATIONS (COMPLIANCE MONITORING)

3.1 MANAGEMENT STRUCTURE

Details of the management structure are presented below. All official communication and reporting lines including instructions, directives and information shall be channelled according to the organisational structure presented below.



3.2 ROLES AND RESPONSIBILITIES

The implementation of this EMP requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management.

3.2.1 PROPONENT (SCHONAU SOLAR ENERGY (PTY) LTD)

The Proponent is ultimately responsible for the implementation of the EMP and the financial cost of all environmental control measures. The Proponent must ensure that any person acting on their behalf complies with the conditions/specifications contained in this EMP. The Proponent is also responsible for the appointment of a Project Engineer, Contractor/s and Independent Environmental Officer (IEO) to the development. It is also the responsibility of the Proponent to consult a Botanist and/or Ecologist to assist with the site layout process to ensure that no loss of critical biodiversity species occur.

The Proponent shall address any site problems pertaining to the environment at the request of the Project Engineer and/or the IEO.

3.2.2 PROJECT ENGINEER

The Project Engineer is responsible for the engineering design of the development and management of the on-site construction activities from the side of the appointed contractors.

The Project Engineer shall as part of his duties address any site problems pertaining to the environment at the request of the Proponent and/or the IEO. The Project Engineer shall have the responsibility to ensure that the Proponent's responsibilities are executed in compliance with the EMP and/or any other documentation proposed from the Proponent and/or IEO. Any on-site decisions with the appointed contractors having relevance to environmental matters are ultimately the responsibility of the Project Engineer.

The Project Engineer shall assist the IEO where necessary and shall have the following responsibilities in terms of the implementation of this EMP:

- The Engineer, along with the IEO and Resident Engineer (RE), must obtain, examine and approve Method Statements.
- Promptly issuing instructions requested by the IEO and Resident Engineer to the Contractor/s.
- Deduct environmental penalties from certificate payments as agreed and instructed by the IEO.
- Assisting the IEO in making decisions and finding solutions to environmental problems that may arise during the construction phase.
- Oversee the responsibilities of the Resident Engineer and Contractor/s, and assist in all required matters.
- Monitor and verify that the EMP are always adhered to and act if specifications are not followed.
- Order the removal of person(s) and/or equipment not complying with the EMP specifications.
- Provide input into the IEO's on-going internal review of the EMP.
- Communicate environmental issues to the IEO.

3.2.3 INDEPENDENT ENVIRONMENTAL OFFICER (IEO)

The Independent Environmental Officer (IEO) is acting on behalf of the Proponent and shall communicate directly with the Project Engineer and/or Proponent. The IEO shall be responsible for monitoring, reviewing, and verifying the Contractor's compliance with the EMP during the construction phase. The IEO shall have the right to investigate the site at any time during the project phases and unexpected visits will be allowed.

The IEO duties shall include, inter alia, the following:

- The IEO shall make recommendations independent of the Project Engineer; take immediate action on Site when (i) prescriptive conditions are violated, or in danger of being violated, and to inform the Project Engineer, Resident Engineer/s and Contractor/s immediately of the occurrence and to take action, e.g. issuing of penalties; and (ii) where

clearly defined and agreed 'no go' areas are violated, or in danger of being violated, and to inform the Project Engineer, Resident Engineer/s and Contractor/s of the occurrence and action taken.

- Advise the Project Engineer, Resident Engineer/s and Contractor and/or the on environmental issues within the project area.
- Undertake regular site visits to ensure compliance with the EMP and verify that environmental impacts are kept to a minimum throughout the construction phase (i.e. construction monitoring).
- Keep a photographic record of progress on site from an environmental perspective.
- Assist the Project Engineer, Resident Engineer/s and/or Contractor the in finding environmentally acceptable solutions to construction problems as and if any arise.
- Recommend additional environmental protection measures should this become necessary.
- Keep a register of complaints and dealing with any community issues or comments.
- Report any incidents to the Proponent and Project Engineer that may or have caused damage to the environment or which is in breach of the EMP.
- Prepare an environmental audit report at the conclusion of the construction phase.
- The IEO, along with the Project Engineer, must obtain, examine and approve Method Statements.
- Ordering the removal of, or issuing penalties for person/s and/or equipment not complying with the specifications of the EMP.
- Involve specialists to advise on environmental management issues as they emerge during the construction phase.

The IEO must have:

- a good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- the ability to conduct inspections and audits and to produce thorough and informative reports;
- the ability to manage public communication and complaints;
- the ability to think holistically about the structure, functioning and performance of environmental systems; and
- proven competence in the application of the following integrated environmental management tools:
 - EIAs.

- EMPs.
- Environmental auditing.
- Mitigation and optimisation of impacts.
- Monitoring and evaluation of impacts.

3.2.4 CONTRACTOR (TO BE APPOINTED)

The Contractor shall have the following responsibilities:

- Implement and monitoring that all provisions of the EMP are always adhered to and acting if specifications are not followed. If the Contractor encounters difficulties with the specifications, he/she must discuss alternative approaches with the IEO and/or the Project Engineer prior to proceeding.
- Monitor and verify that the environmental impacts are kept to a minimum and mitigations proposed are applied throughout the construction phase.
- Make and keep construction personnel aware of environmental issues and to ensure they show adequate consideration to the environmental sensitivities.
- Report any incidents of non-compliance with the EMP to the Project Engineer and/or the IEO.
- Keep a register of complaints on-site and record community comments and issues, and the actions taken in response to these complaints.
- Rehabilitate any sensitive environments damaged due to his/her negligence. This shall be done in accordance with the IEO and Project Engineer's specifications and instructions.
- The Contractor shall ensure that no damage whatsoever is caused because of his operations or otherwise by his workmen in the areas adjacent to the construction sites.
- The Contractor shall ensure that his workmen are properly instructed and carry out the requirements of this EMP.
- The Contractor will be held liable for all unauthorised damage caused by him or any of his workmen or Sub-Contractors.

Failure to comply with the EMP from the side of the contractor may result in penalties (Appendix B) and reported non-compliance may result in the suspension of work or termination of the contract by the Project Engineer on instruction from the Proponent.

3.3 DISPUTES AND DISAGREEMENTS

Any disputes or disagreements between role players on Site (regarding environmental management) will be referred to the Directorate of Environmental Affairs (Ministry of

Environment and Tourism). If no resolution on the matter is possible it must be presented to an outside party agreed by all parties involved.

3.4 EMP MONITORING RESPONSIBILITIES

The day-to-day monitoring and verification that the EMP is being adhered to shall be undertaken by the appointed Contractor/s.

The IEO shall visit and inspect the site at least once a month to ensure that correct operational procedures are being implemented and that the Contractor is complying with the environmental specifications of the EMP.

Additional site inspections by the IEO may be required during the initial and final stages of the construction phase. The IEO shall address any queries to the Project Engineer. If the queries cannot be resolved at this level, they shall be referred to the Proponent, if necessary.

- The IEO will carry the responsibility of monitoring the implementation of the EMP on Site, assisted by the Project Engineer. In this regard, the IEO will submit a monthly monitoring report to the DEA until after all rehabilitation work has been completed. A pro-forma Monitoring Report is contained in Appendix C.
- Regular meetings will be held between the Project Engineer, Resident Engineer, Contractor/s and the IEO. The purposes of the meetings shall be:
 - To establish the suitability of the Contractor's methods and machinery to lower the risk involved for the environment.
 - To discuss possible non-conformance to EMP guidelines or environmental legislation.
 - To assess the general state of the environment on site and discuss any environmental problems which may have materialised.

Any non-compliance with the agreed procedures of the EMP is a transgression of the various statutes and laws that define how the environment is managed. Non-conformance identified during monitoring must be recorded. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor and could stand as evidence should legal action be required. If possible, photographs should also be included as evidence to substantiate the report. This report will also suggest mitigation measures to correct the non-conformance (if necessary) and contemplate revisions to any of the strategies used in the construction phase, whether they pertain to monitoring or to construction methods used on site. The non-conformance shall be documented and reported as part of the Monitoring Report.

3.5 POST-CONSTRUCTION ENVIRONMENTAL AUDIT

A post-construction environmental audit must be carried out to fulfil conditions of this EMP.

3.6 NON-COMPLIANCE AND PENALTIES

The IEO shall issue the Contractor a notice of non-compliance whenever transgressions are observed. The Contractor/s shall act immediately when such notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the project site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken.

The Contractor is deemed not to have complied with the EMP if, inter alia:

- There is evidence of contravention of the EMP specifications within the boundaries of the project site, site extensions and roads;
- There is contravention of the EMP specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or
- The Contractor fails to comply with corrective or other instructions issued by the IEO and/or Engineer within a specific time.
- The Contractor fails to respond adequately to complaints from the public.

A system of penalties shall be implemented to ensure compliance with the EMP (see Appendix B). Where the Contractor inflicts irreparable damage upon the environment or fails to comply with any of the environmental specifications of the EMP (within 10 days) this would constitute a breach of Contract for which the Contractor may be liable to pay a penalty.

The system of penalties shall be implemented in the following way:

- Penalties shall be issued per incident and individual at the discretion of the IEO;
- Penalties shall be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications;
- The IEO shall not collect the penalties from individuals, but shall inform the Project Engineer and Contractor of the contravention, the individual's identity, and the amount of the penalties; and
- Penalties, including but not limited to those activities presented in Appendix B, shall be imposed by the Project Engineer on the Contractor, his staff, and/or the subcontractors' staff for contravention of the environmental specifications. Where there are ranges, the amount shall depend on the severity and extent of the damage done to the environment.

Failure by any employee of the Contractor or their sub-contractors to show adequate consideration to the environmental aspects of the contract shall be considered sufficient cause for the Project Engineer to have that employee removed from the site. The IEO may, through the Project Engineer, also order the removal of equipment that is causing continual environmental damage.

It is recommended that the engineers/contractors institute penalties for the following violations and any others determined during work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Hazardous chemical/oil spill and/or dumping in non-approved sites and persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Any vehicles being driven more than designated speed limits.
- Any vehicles driven off demarcated tracks.
- Damage to sensitive environments.
- Uncontrolled/unmanaged erosion.
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Possession or use of intoxicating substances on site.
- Urination and defecation anywhere except at designated facilities.
- Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMP, the Contractor shall be liable.

3.7 ENVIRONMENTAL COMPLETION STATEMENT

An Environmental Completion Statement will be prepared by the IEO for submission to the Department of Environmental Affairs indicating completion of construction and compliance with the EMP and conditions. This statement will be prepared after the final construction audit.

3.8 EMERGENCY PREPAREDNESS

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities may include, inter alia:

- Accidental fires.
- Accidental spillage of hazardous substances.

- Accidental discharges to land.
- Accidental exposure of employees to hazardous substances.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans shall include:

- Emergency organisation (manpower) and responsibilities, accountability, and liability.
- A list of key personnel and contact details.
- Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.

3.9 ENVIRONMENTAL AWARENESS TRAINING

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained about the implementation of the EMP, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the Contractor's Health and Safety Officer where necessary.

The purpose of this environmental training is to provide a general explanation of sustainable environmental practises, but also to explain the content of the EMP, the relevance thereof and how it will be implemented through monitoring. The environmental specifications as per Chapter 4 of this EMP should clearly be explained to all the Contractors and their site staff, as well as non-compliance to it and related penalties.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. The Contractor shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the EMP. The presentation needs to be conducted in the language of the employees to ensure it is understood.

The environmental training shall, as a minimum, include the following:

- The mitigation measures required to be implemented when carrying out their work activities.
- Environmental legal requirements and obligations.

- Details regarding flora/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.

3.10 INFORMATION BOARD(S)

The Contractor shall be responsible for erecting information boards on site. The number and locations of these boards shall be agreed by the Project Engineer and IEO.

Information boards should be placed at conspicuous locations at the entrance to the project site. The contents of the information board shall be provided by the Project Engineer and will essentially be to advise the public of the construction operation and the prohibition on entering certain areas. The information board shall apart from the details of the contractor also provide the name and contact number of the Project Engineer to ensure that the public has access to the engineer to ask for information and/or to lodge any complaints.

3.11 METHOD STATEMENTS

Method statements from the Contractor will be required for specific sensitive actions on request of the authorities or IEO. A method statement forms the baseline information on which sensitive area work takes place and is thus considered a “live document” in that modifications can be negotiated between the Contractor and IEO if or as required. The Contractor (and, where relevant, any subcontractors) must also sign the Method Statement, thereby indicating that the works will be carried out according to the approved methodology. Changes in the methodology must be reflected by amendments to the original approved Method Statement. Amendments must be signed by both the IEO and RE, denoting that the change is environmentally acceptable. The Contractor must also sign the amended Method Statement.

All method statements will form part of the EMP documentation and are subject to all terms and conditions contained within the EMP main document (see Appendix D). The Method Statement shall cover applicable details about:

- Construction procedures;
- Materials and equipment to be used;
- How and where materials will be stored;
- The containment of accidental leaks or spills;

- Timing and location of activities; and
- Any other information deemed necessary by the IEO.

A method statement describes the scope of the intended work in a step-by-step description for the IEO or Engineer 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. The method statement should also clearly stipulate mitigation methods of the intended works, against which the contractor's performance will be measured. For each instance wherein it is requested that the Contractor submit a method statement to the satisfaction of the IEO and Engineer, the format should clearly indicate the following:

- What - a concise, description of the task/work to be undertaken;
- How - a detailed description of the process of work, methods, materials and mitigation strategies;
- Where - a description/sketch map of the locality of work (if applicable); and
- When - the sequencing of actions with due commencement dates and completion date estimates.

The Contractor must submit the method statement two weeks before any construction activity is due to start. Work may not commence until the method statement has been accepted by the IEO and Engineer, and clearly communicated to the workforce. The Contractor shall, except in the case of emergency activities, allow 14 days for consideration and approval of the Method Statement. The RE or IEO may require changes to a Method Statement if the proposal does not comply with the specifications or if, in the reasonable opinion of the RE or IEO, the proposal may result in damage to the environment in excess of that permitted by the specifications. Approved Method Statements shall be communicated to all relevant personnel.

All Method Statements listed below, shall be provided by the Contractor before the activity commences:

- Dust
 - Dust control protocol.
- Concrete batching
 - Location, layout, and preparation of concrete batching facilities, including the methods employed for mixing of concrete including the management of runoff water from such areas.
- Demolition
 - Proposed method of demolition, including handling and disposal of materials.
- Fire and hazardous substances
 - Handling and storage of hazardous wastes.

- Emergency spillage procedures and compounds to be used
- Emergency procedures for accidental fire.
- Methods for the disposal of hazardous materials.
- Fuels and fuel spills.
- Methods of refuelling vehicles.
- Details of methods for fuel spills and clean-up operations.
- Protection of archaeological resources
 - Methods for dealing with archaeological resources if any are found.
- Protection of environmentally sensitive resources (fauna and flora)
 - Methods for dealing with areas identified as environmentally sensitive requiring protection.
 - Locality and preparation of onsite nursery to house vegetation relocated from construction areas or propagated locally for replanting purposes.
 - Details of methods dealing with the identification, transportation and transplanting of flora species of conservation value.
 - Details of methods dealing with the identification, capture and relocation of fauna species of conservation value.
- Rehabilitation
 - Rehabilitation of disturbed areas after construction is complete.
- Solid waste management
 - Solid waste control and removal of waste from Site.
- Topsoil handling and stockpiling
 - Details on stripping, handling, and stockpiling of topsoil.
- Wash areas
 - Location, layout, preparation, and operation of all wash areas.
- Storm water management
 - Details of how storm water is to be handled on Site.

See Appendix D for more information on the Method Statement and Pro-forma Method Statement.

3.12 RECORD KEEPING

All records related to the implementation of this management plan (e.g. site instruction book, HSE Officers daily diary, induction records, method statements) must be kept together in an office where it is safe and can be retrieved easily. All relevant records should be kept for a minimum of two years after construction and should at any time be available for scrutiny by any relevant authority or stakeholder.

It is recommended that photographs (fixed point photographs for better comparisons before/during/after) are taken of the site prior to, during and immediately after construction as a visual reference. These photographs should be stored with related documents and other records related to this EMP.

A list of other reports to be kept on site is:

- Final site layout, design documents and diagrams issued to and by the Contractor.
- All communications detailing changes of design/scope that may have environmental implications.
- Occupational Health and Safety reports.
- Complaints register.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Search & Rescue monitoring plan.
- Crisis communication manual.
- Site meeting minutes during construction.
- All relevant permits.
- All method statements from the Contractor.

4 ENVIRONMENTAL SPECIFICATIONS

4.1 SCOPE

These specifications cover the requirements for controlling the impact of construction activities on the natural and social environment.

4.2 CONSTRUCTION

4.2.1 SITE DIVISION

The IEO and Project Engineer shall advise the Contractor of the area that should be used for the establishment of the construction site. The Contractor's Camp shall occupy as small an area as possible.

The Contractor shall restrict all his activities, materials, equipment and personnel to within the specified area. A Method Statement detailing the location, layout and method of establishment of the Contractor's Camp (including all buildings, offices, temporary accommodation, temporary ablutions, eating areas, lay down yards, plant wash areas, fuel storage areas, batching areas and other infrastructure required for the running of the project) shall be provided.

(i) *Construction Area*

- The Contractor shall submit a Method Statement, indicating the layout and preparation of the Construction Area where building material will be temporary stored, which should be the same area where the operations and maintenance office building will be constructed (this shall include the positioning of any fuels/hazardous materials stores).
- The planning and design for the Construction Area must ensure that there is minimal impact on the environment. The following should apply:
 - The Construction Area will be placed within an existing disturbed area as far as possible.
 - The Construction Area shall be in an area of low environmental sensitivity.
 - Its final location and extent shall be identified and agreed upon in consultation with the Proponent, Project Engineer, IEO and Botanist/Ecologist.
- With the decommissioning of the structures all compacted platforms and slab foundations must be ripped up and be removed.

(ii) *Vehicle Parking Area*

All vehicles will be allocated a dedicated parking area within in the Construction Area. The position of which will be agreed by the Proponent, Project Engineer, IEO and Botanist/Ecologist. No storage of vehicles will be allowed outside of the designated areas.

4.2.2 CEMENT AND CONCRETE BATCHING

(i) Location

- It is recommended that bulk cement storage be kept at the Construction Area.
- The concrete batching activity shall be in dedicated areas of low environmental sensitivity to be identified and approved by the Proponent, Project Engineer, IEO and Botanist/Ecologist.
- The permitted location of a batching plant (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the site layout plan and approved by the Proponent, Project Engineer, IEO and Botanist/Ecologist. A Method Statement indicating the layout and preparation of this facility is required in this regard.

(ii) Maintenance

- Cement should be covered entirely by impervious sheeting or placed in a contained and closed-off area.
- All wastewater resulting from batching of concrete shall be disposed of via the wastewater management system.
- The concrete batching works shall always be kept neat and clean. No batching activities shall occur on unprotected substratum of any kind.
- All runoff from batching areas shall be strictly controlled and cement-contaminated water shall be collected, stored and disposed of at a site approved by the Engineer and IEO. Dagma boards, mixing trays and impermeable sumps shall be used at all mixing and supply points.
- Contaminated water storage facilities shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented.
- Unused cement bags are to be stored so as not to be affected by rain or runoff events.
- Used cement bags shall be stored in weatherproof containers to prevent windblown cement dust. Used bags shall be disposed of on a regular basis via the solid waste management system and shall not be used for any other purpose.
- Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment: Care shall be taken to collect contaminated wash water from cleaning activities and dispose of it in a manner approved by the RE and IEO.
- Suitable screening and containment shall be in place to prevent wind-blown contamination associated with bulk cement silos, loading and batching.
- With respect to exposed aggregate finishes, the Contractor shall collect all contaminated water and fine material and store it in sumps for disposal at an approved waste-disposal site.

- All visible remains of excess concrete shall be removed on completion of the plaster or concrete pour work and disposed of. All excess aggregate shall also be removed.

4.2.3 EARTHWORKS

No major earthworks are envisaged for the construction of the solar park. The method of construction is different from the norm in that respect that the site is not entirely cleared of vegetation. The poles will either be rammed into the ground or holes will be drilled with an auger drill machine, which have two tracks on which it moves. The vegetation disturbance will happen along the track of this machine, i.e. two tracks of 500mm in width per track, as well as the 800mm concrete collar around the pole. All earthworks shall be undertaken in such a manner to minimise the extent of any impacts caused by such activities. The Contractor/s shall take all reasonable measures to limit vegetation destruction. Earthworks are to be phased so that no areas are left exposed for longer than is necessary. This is especially important during the rainy season where runoff may cause erosion and loss of topsoil, etc.

(i) *Trenching*

Direct buried cable routes will be kept to a minimum to allow easy maintenance inspection. Raised cable trays will feed electricity generated down each tracker row. At the end of the tracker rows a trenched system would be used to link the rows to field transformer stations. The field transformer stations would be linked to the site substation via a trenched system. Cable trench depth would be between 400 and 1000 mm. Trenching for services shall be undertaken in accordance with the engineering specifications with the following environmental amplifications, where applicable:

- Excavated material will be re-used for backfill of the trenches though some imported soil material may be required depending on the soil's thermal capacity of the soil on site.
- Soil from the first trench shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the services have been laid. The last trench shall be filled using the soil stockpiled from the first trench.
- Trench lengths shall be kept as short as possible before backfilling and compacting.
- Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion.

(ii) *Drilling and Jackhammering*

- The Contractor/s shall ensure that no pollution results from drilling operations, either because of oil and fuel drips or from drilling fluid. The Contractor/s shall take all reasonable measures to limit dust generation and noise because of drilling operations.
- Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor/s to the satisfaction of the RE and IEO.
- The Contractor shall submit a Method Statement detailing his proposals to prevent pollution during drilling operations.

(iii) *Borrow Pits*

- If borrow pits are required, the Engineer need to obtain approval from the DEA.
- A Method Statement shall be required in this regard.

4.2.4 FENCING

An electrified fence will be installed along the perimeter of the 200 ha site area and will have a total of 6036 m. It is further important that works be conducted within a limited Construction Area to facilitate control and to minimise the footprint on the surrounding environment. The purpose of the fenced area is to control construction and personnel activity within this designated area, and limit unauthorised access.

- No unauthorised pedestrian or vehicular access shall be allowed into fenced, off-limit areas.
- Fences will be constructed around Heritage resources (should these be present) to prevent access into such areas during construction.
- If fencing is removed temporarily for the execution of work, the Contractor shall reinstate it as soon as practicable. Until re-instatement, the contractor shall demarcate the working area by surrounding it with danger-tape marking.
- Breaches in the fencing must be repaired immediately.
- The Contractor to the satisfaction of the RE and IEO shall erect and maintain all fencing. Such fence shall be erected before the start of any construction works.

4.2.5 ACCESS ROUTES

The plant access and internal road will be a 4m wide compacted gravel road to accommodate large trucks that need to access the site during emergencies and repairs. The construction of this road will involve bush clearing, grading of surface, in-situ gravel compacting, imported surface soil grading and compacting. Any crossings of water drainage lines will be engineered to allow water thoroughfare.

- The movement of plant and workmen shall be restricted to the construction area and access route. The access route, which shall need the approval of the Project Engineer and IEO, shall be along existing routes as far as possible. The Contractor/s shall control the movement of all vehicles and plant machinery so that they remain on designated/demarcated routes.
- New routes (temporary or permanent) should be planned in consultation with the Project Engineer and IEO and constructed and maintained in such a manner not to cause any harm or damage to the natural environment. Temporary roads should be rehabilitated soon after their purpose has expired and should be done in a manner as approved by the IEO.
- Special care should be taken to prevent spillages on the roads. Vehicles should be equipped with drip trays to prevent oil and fuel spillages. In the event of spillages, it

should be reported to the Resident Engineer and IEO immediately and cleaned as soon as possible.

- The speed limit for light vehicles is 40 km/h and for heavy vehicles 20 km/h. No vehicles are to leave or reverse off designated access roads unless at areas previously agreed to with the Project Engineer or ECO.
- Notices should be placed on visible locations in the vicinity of the construction area to warn public of construction activities and indicating that heavy vehicles may be using the road. Failure to maintain road signs, warning signs or flicker lights, etc., in a good condition shall constitute ample reason for the Project Engineer to suspend the work until the road signs, etc., have been remedied to his satisfaction.
- During construction of roads the Contractor/s shall protect all areas susceptible to erosion by installing all necessary temporary and permanent drainage works and speed humps as soon as possible.

4.2.6 CLEARING AND GRUBBING FOR CONSTRUCTION PURPOSE

Clearing should first be discussed with the PE and IEO (in consultation with Botanist/Ecologist) before commencement. Within the site the Contractor shall take steps to protect all vegetation and soil not directly affected by the works and shall ensure that no avoidable damage or disturbance is caused, and that no erosion is allowed to occur.

(i) Protected Vegetation Location and Rescue

- The location and rescue of endemic and/or protected plants, and their transfer to a specified location shall be conducted by the IEO (in consultation with a suitably qualified Botanist/Ecologist) prior to the onset of any site clearing operations.
- Where possible direct transplantation of rescued plant material, into areas earmarked and prepared for revegetation, shall occur. Transplantation shall only occur in areas of similar habitat and soil type from which rescued plant material originates.
- Where direct transplantation is not feasible, plant material shall be moved to a nursery for transplantation once the permanent revegetation areas become available.
- Rescued plants, which are to be stockpiled at a nursery, shall be stored under damp shade cloth/hessian until they are transported to these sites. They shall be watered and bagged in the topsoil from the area.

(ii) Vegetation Clearance

- The Contractor shall ensure that the clearance of vegetation is only restricted to that required to facilitate the execution of the construction works.
- Vegetation should preferably be cleared manually making use of labourers. Care shall be taken to minimise the disturbance to topsoil during this process.

- All cleared areas shall be stabilised as soon as possible. Areas that are, in the opinion of the IEO, less stable, shall be stabilised immediately following vegetation clearance to control wind-blown dust and erosion.
- All alien vegetation species situated within of the proposed project should be removed.
- Vegetation not to be removed (i.e. indigenous and protected species) should be identified and marked by the IEO (in consultation with a suitably qualified Botanist/Ecologist).
- The use of herbicides is prohibited.
- The disposal of vegetation through burying or burning is prohibited. Stockpiling of cut vegetation shall only be permitted in areas indicated by the IEO and/or Project Engineer.

(iii) Conservation of Topsoil

- Where necessary topsoil (an approximately 300mm layer) shall be removed from areas to be disturbed during construction and stockpiled for rehabilitation purposes.
- The Contractor shall always carefully consider what machinery is appropriate for the task while minimising the extent of environmental damage.
- Topsoil is to be handled twice only – once during clearing and stockpiling & once during rehabilitation.
- Topsoil stockpiles shall not be subject to compaction greater than 1500 kg/m² and shall not be pushed by a bulldozer for more than 50m. Stockpiles shall be monitored regularly to identify any alien plants, which shall be removed when they germinate to prevent contamination of the seed bank.
- Appropriate measures, as agreed with the IEO and Project Engineer, shall be taken to protect topsoil stockpiles from erosion by wind or water by providing suitable storm water and cut off drains, containment using hessian or similar material and/or by establishing suitable temporary vegetation. Stockpiles shall not be covered with materials such as plastic that may cause it to compost or would kill the seed bank.
- No vehicles shall be allowed access onto the stockpiles after they have been placed.
- The Contractor shall be held responsible for the replacement, at his/her own cost, for any unnecessary loss of topsoil due to his failure to work according to the requirements of this EMP.

4.2.7 STOCKPILING

- The Project Engineer and IEO will identify suitable sites for stockpiling.
- Stockpiles shall be convex in shape, shall be no higher than 2m and shall be located to cause minimal disturbance. Stockpiles shall be so placed to occupy minimum width compatible with the natural angle of repose of material, and measures shall be taken to prevent the material from being spread over too wide a surface. Where required,

appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not cause the damming of water or run off or is itself washed away.

- Top material stockpiles shall not be covered with any material (e.g. plastic) that may kill seeds or cause it to compost. If the stockpiles start to erode significantly or cause dust problems, they shall be covered with hessian. Where practical, top material shall not be left for longer than eight months before being used for rehabilitation. If stored for longer than eight months, the top material shall be analysed and, if necessary, upgraded before placement.

4.2.8 NO-GO AREAS

- Areas outside the demarcated Construction Area as well as areas on the site identified as sensitive by the IEO, are 'no go' areas.
- No unauthorised entry, stockpiling, dumping or storage of equipment or material shall be allowed outside the demarcated work areas.

4.2.9 PROTECTION OF NATURAL FEATURES

- The Contractor shall not deface, paint, damage or mark any natural features situated in or around the project site for survey or other purposes unless agreed beforehand with the IEO.
- Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the IEO.

4.2.10 PROTECTION OF INDIGENOUS FAUNA AND FLORA

- No herbicides, pesticides and other poisonous substances to be used and/or stored on-site.
- Collecting of wood and/or killing of trees in the area for the purpose of firewood is prohibited.
- No removing of birds' nests or eggs allowed.
- No collection of fruit or seeds allowed.
- Nobody may enter important habitat areas (hills/outcrops/mountains, etc.) outside of the project area;
- No collection of unique plants (e.g. various Aloe and Lithop species);
- No introduction of ornamental plants, especially potential invasive alien species, as part of the landscaping, but rather use localised indigenous species;
- Remove all invasive alien species on site – e.g. *Prosopis spp.*, etc. – should these occur.
- No driving on site at night as this increases mortalities of nocturnal species;

- Avoid and/or limit the use of lights during the night as this could influence and/or affect various nocturnal species – e.g. bats and owls, etc. Use focused lighting for least effect;
- No killing of species viewed as dangerous – e.g. various snakes – when on site;
- No setting of snares or any form of illegal hunting activities;
- No dogs or cats to be kept on site;
- Remove and relocate slow moving vertebrate fauna (e.g. tortoises, chameleon, snakes, etc.) to suitable habitat elsewhere in area;
- Do not electrify strands around the solar plant lower than 20cm from the ground as this could result in tortoise mortalities;
- Introduce genet and baboon mitigation measures (e.g. cover bushings and/or electrify perimeter fence although not lower than 20cm from the ground so as to avoid tortoise mortalities, etc.);
- Keep a mammal electrocution monitoring programme after construction to determine “high risk” areas so as to mitigate these areas as well once identified.
- Keep a bird collision monitoring programme after construction to determine “high collision” areas so as to mitigate these areas as well once identified;
- No feeding of any wild animals.

4.2.11 EROSION AND SEDIMENTATION CONTROL

- During construction works, the Contractor shall protect all areas susceptible to erosion.
- Any erosion channels developed during construction or during the defect’s liability period shall be backfilled and compacted, and the areas restored. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Traffic and movement over stabilised areas shall be restricted and controlled and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Engineer.
- Anti-erosion compounds shall consist of an organic or inorganic material to bind soil particles together and shall be a proven product able to suppress dust and erosion. The method of stabilisation shall be determined in consultation with the Project Engineer and IEO. Consideration shall be made to make use of mechanical covers or packing structures, e.g. gabions and mattresses, geofabric, hessian cover, armourflex, log/pole fencing and retaining walls.

4.2.12 LANDSCAPING AND REHABILITATION

- On completion of the construction phase, the Contractor shall ensure that all structures, equipment, materials, waste, rubble, notice boards and temporary fences used during the construction operation are removed with minimum damage to the immediate and surrounding area. The Contractor shall clean and clear the site to the satisfaction of the IEO.

- Any areas that the IEO believe may have been impacted upon or disturbed shall be rehabilitated to his/her satisfaction, which includes all areas where top material has been stripped. The area/s to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be as per the specifications from a suitably qualified Botanist/Ecologist.
- All rehabilitated areas shall be considered “no go” areas and the Contractor shall ensure that none of his staff or equipment enters these areas. The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.
- For all rehabilitation work, only plants approved by suitably qualified Ecologist may be used. No declared invasive alien species may be used.

4.2.13 PROTECTION OF ARCHAEOLOGICAL AND PALEONTOLOGICAL REMAINS

- Archaeological sites are protected by the National Heritage Act No 27 of 2004. Generally, it is an offence to disturb, destroy or remove from its original site any archaeological material, or excavate any such site without permission.
- The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the project site, immediately upon discovery thereof and before removal.
- If an archaeological site or remains (i.e. fossils, coins, articles of value or antiquity) is discovered during any construction activity, the work is to be halted and the “chance finds” procedure are to be followed.
- The “chance finds” procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment by a trained archaeologist or other appropriately qualified person. This process involves the following:
 - Procedure:
Action by person identifying archaeological or heritage material
 - a) If operating machinery or equipment stop work
 - b) Identify the site with flag tape
 - c) Determine GPS position if possible
 - d) Report findings to ESM
 - Responsibility:
Contractor To exercise due caution if archaeological remains are found

RE	To secure site and advise management timeously
IEO	To determine safe working boundary and request inspection
Archaeologist	To inspect, identify, advise management, and recover remains

- The Project Engineer and IEO should be notified immediately, who shall contact the Namibian Heritage Council. Only after the site has been inspected by an Archaeologist other appropriately qualified person will the Contractor be allowed to continue.
- The Contractor will be required to abide by the specifications as set out by the Namibian Heritage Council or the heritage specialist appointed to investigate the find. The Contractor may not, without a permit issued by the relevant heritage resources authority, destroy damage, excavate, alter, deface or otherwise disturb archaeological material.
- The Project Engineer and IEO are to be kept informed of all developments in the event where modifications are made to the clearing or earthworks schedule.

4.2.14 SAFETY

- Relevant occupational Health and Safety requirements shall be adhered to. Telephone numbers of emergency services, including the fire safety officer, shall be displayed conspicuously in the Contractor's office near a telephone. No firearms are permitted.
- Staff must be made aware of their responsibilities to ensure that impacts such as fire, safety and pollution are taken care of. This must form part of the Environmental Education. The movement of construction workers must be controlled and access to adjacent properties must be prohibited.
- The contractor's personnel must be adequately trained and informed in the tasks that they are expected to perform. This is required for their own safety as well as the safety of colleagues and other interested and/or affected parties.
- All excavated areas and/or holes should be clearly demarcated.

4.2.15 FIRE CONTROL

- No fires may be lit except if approved by the Project Engineer or IEO, and in properly prepared facilities approved by the IEO. Fires shall be kept small and appropriate to their function.
- The Contractor shall ensure that the fire risk on and near the site is reduced to a minimum and shall take immediate and effective steps to extinguish any fire that may break out.
- All costs relating to damage by fire caused by the Contractor will be for the Contractor's cost. No collection of firewood allowed.
- Smoking is only permitted in designated smoking areas. Appropriate signage shall be erected in these areas. A container filled with sand and a dedicated fire extinguisher must be available at the smoking area.

- In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.
- The Contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire. The Contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire. The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the PE and IEO in the event of a fire and shall not delay doing so until such time as the fire is beyond his/her control.
- The Contractor shall ensure that there is always basic fire-fighting equipment on site. This equipment shall include fire buckets, fire extinguishers and fire beaters.

4.2.16 EMERGENCY PROCEDURES

The Contractor's procedures for the following emergencies shall include:

(i) Fire

- The Contractor shall inform all relevant parties of a fire as soon as one starts and shall not wait until it can no longer be controlled.
- The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

(ii) Accidental Leaks and Spillages

- The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the IEO and Resident Engineer.
- The Contractor shall ensure that the necessary materials (e.g. chemcap, spill-sorb, drizzat pads, enretech and peat moss) and equipment for dealing with spills and leaks are always available on Site.
- The source of the spillage shall be isolated. The Contractor shall contain the spillage using sand berms, sandbags, pre-made booms, saw dust or absorbent materials. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Project Engineer and IEO.

4.2.17 COMMUNITY RELATIONS

- The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Project Engineer.
- The Contractor shall also keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself.

4.2.18 CONSTRUCTION PERSONNEL INFORMATION POSTERS

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the specifications. Such posters shall be erected at the Construction area.

4.2.19 TEMPORARY SITE CLOSURE

If the project site is closed for a period exceeding one week, the following checklist procedure shall be carried out by the Contractor in consultation with the Project Engineer and IEO. Contractor's Safety Officers (in terms of the relevant Occupational Health and Safety Act) to check the Site and report.

(i) Fuels/flammables/hazardous materials stores

- Ensure fuel stores as low in volume as possible.
- No leaks.
- Outlet secure/locked.
- Bund empty (where applicable).
- Fire extinguishers serviced and accessible.
- Secure area from accidental damage, e.g. plant collision.
- Emergency and contact numbers to be available and displayed.
- Adequate ventilation.

(ii) Safety

- All trenches and manholes secured.
- Fencing and barriers in place as per the relevant Occupational Health and Safety Act.
- Notice boards applicable and secured.
- Emergency and management contact details displayed.
- Security persons briefed and have facility for contact.
- Fire hazards identified.
- Inspection schedule and log by security staff.

(iii) Erosion and Siltation

- Wind and dust mitigation in place.
- Stockpiles at stable angle.
- Erosion protection measures in place.

(iv) *Water Contamination and Pollution*

- Fuels hazardous stores secure.
- Cement and materials stores secured.
- Toilets empty and secured.
- Refuse bins empty and secured (lids).
- Bunding clean and treated.
- Drip trays empty and secure (where possible).
- Structures vulnerable to high winds secure.

4.3 MATERIALS

4.3.1 HAZARDOUS SUBSTANCES

If petroleum, chemicals, harmful and hazardous waste needs to be stored, it must be kept in an enclosed and bunded area at the construction area. This area shall be subject to the approval of the Project Engineer and IEO. The waste shall be disposed of at the nearest Hazardous Waste Disposal Site.

4.3.2 HANDLING, USE AND STORAGE OF CONSTRUCTION MATERIALS

- The Contractor shall ensure that delivery personnel are informed of all procedures and restrictions (including 'no go' areas) required to comply with the Specifications. The Contractor shall ensure that delivery personnel are supervised during offloading by someone with an adequate understanding of the requirements of the Specifications.
- Materials shall be appropriately secured to ensure safe passage between destinations.
- Loads including, but not limited to sand, stone chip, cement, and refuse, shall have appropriate cover to prevent them spilling during transit.
- The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.
- All manufactured and/or imported material/technology shall be stored within the Construction Area.

(i) *Importation of Fill/Soil/Sand Materials*

- Imported materials shall be free of weeds, seeds, litter and contaminants.
- Sources of imported material shall be listed and approved by the Project Engineer.
- Stockpile areas will be identified by the Project Engineer and agreed upon by the IEO before any stockpiling commences.

(ii) *Topsoil*

- The top 300mm of topsoil must be stripped before any grading or bulk earthworks begin and stockpiled separately for use in rehabilitation. Topsoil may not be compacted or covered in any way during stockpiling.
- Topsoil shall be stockpiled in the area where it was removed and should be used again in the vicinity where it was removed.

(iii) *Spoil Material*

- The location of spoil stockpiles shall be identified by the Project Engineer and IEO prior to any stockpiling.
- No spoil material shall be dumped outside the defined site unless it is being removed from the site, as approved by the Project Engineer and IEO.
- Spoil stockpiles shall be convex and should not exceed 2m in height. The Contractor shall ensure that the spoil material does not blow or wash away. If it is in danger of being washed or blown away, the Contractor shall cover it with a suitable material, such as hessian or plastic.

4.4 CONSTRUCTION AREA

4.4.1 FUEL AND OIL

Fuel should be stored at the Construction Area in a depot complying with the requirements listed below. The surface under the refuelling area shall be protected (bund) against pollution to the satisfaction of the Project Engineer and IEO prior to any refuelling activities.

The Contractor shall ensure that there is always a supply of absorbent material (e.g. chemcap, spill-sorb, drizzat pads, enretech and peat moss) readily available to neutralise and where possible be designed to encapsulate minor spillage. The quantity of such materials shall be able to handle a minimum of 200L of liquid spill.

4.4.2 ABLUTION FACILITIES

The Contractor shall provide suitable temporary sanitary arrangements within the boundaries of the Construction Area or within walking distance ($\pm 200\text{m}$) from where construction activities are taking place.

The exact location of the facilities shall be approved by the Project Engineer and IEO prior to establishment. All temporary portable toilets shall be secured to the ground to prevent them toppling due to wind or any other cause.

Toilets supplied by the Contractor for the workers shall occur at a maximum ratio of 1 toilet per 15 workers and be within walking distance of the staff. These facilities shall be maintained in a hygienic state and serviced regularly. Toilet paper shall be provided. The Contractor shall ensure that toilets are emptied regularly. 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 is prohibited.

4.4.3 EATING AREA

Eating areas should be within the boundaries of the Construction Area as agreed with by the IEO. Temporary eating areas (i.e. outside the construction camp) would require strict requirements and control and would only be allowed once approved by the IEO.

The Contractor shall provide adequate refuse bins at the eating area (i.e. permanent or temporary eating areas) to the satisfaction of the IEO and shall ensure that all eating areas are cleaned daily. Collected waste shall be stored in a central waste area at the main construction camp and disposed of at an appropriate solid waste site on a regular basis. Waste receipts in this regard should be kept on site.

Waste bins at the eating areas should have scavenger proof lids and not left overnight but removed to the main construction camp on a daily basis.

Cooking of food shall be done using gas cookers only and within the main construction area only. Cooking with wood is strictly prohibited. No fires may be lit except if approved by the IEO, and in properly prepared facilities approved by the Project Engineer.

4.4.4 SOLID WASTE MANAGEMENT

No burying or dumping of any waste materials, rubble or refuse shall occur on Site. The Contractor shall set up a solid waste control and removal system at the main construction camp and waste shall be disposed of at an appropriate solid waste site on a regular basis. Waste receipts in this regard should be kept on site.

Waste bins at the eating areas should not be left overnight but removed to the solid waste control and removal system at the main construction camp daily.

The accumulation of construction waste materials must be avoided as far as possible. The system shall comply with the following detailed requirements:

(i) Dumping

- Receipts for hazardous waste disposal shall be copied to the IEO and Project Engineer.
- Refuse must be disposed of at an appropriate landfill site.
- The Contractor shall make provision for workers to clean up the camps and working areas daily.

(ii) Recycling

- Wherever possible, materials used or generated by construction shall be recycled.
- Containers for glass, paper, metals, and plastics (a four-bin recycling system) shall be provided at the main construction camp.

- Where possible and practical, such as at stores and offices, waste shall be sorted for recycling purposes.

4.4.5 WASTEWATER MANAGEMENT

The Contractor shall set up a contaminated water management system, which shall include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water to fit into the larger wastewater management system. The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints, and fuels, into the environment. The Contractor shall notify the IEO and Project Engineer immediately of any pollution incidents on Site.

Water from kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for treatment or removal from Site. Runoff from fuel depots/workshops/truck washing areas and concrete swills shall be directed into a conservancy tank and disposed of at an appropriate hazardous waste site.

Wash areas shall be placed and constructed in such a manner to ensure that the surrounding areas are not polluted. This includes, but is not limited to; concrete batching areas, vehicle washing, workshop wash bays, paint wash and cleaning. Wash areas for domestic use at the main construction camp shall ensure that the disposal of contaminated water is sanctioned by the IEO.

4.4.6 WORKSHOP, EQUIPMENT MAINTENANCE AND STORAGE

All plant and equipment shall be kept in good working order and serviced regularly. When maintenance of plant and equipment needs to be undertaken, the Contractor shall obtain the approval of the IEO prior to commencing activities.

Faulty equipment shall be removed from the project site and repaired in an appropriate workshop. When the Contractor carries out emergency plant maintenance, it is essential that there is no pollution to the environment. This will be overseen by the IEO and Project Engineer.

When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall be inspected and emptied daily. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. Where practical, the Contractor shall ensure that equipment is covered so that rainwater is excluded from the drip trays.

No washing of construction vehicles or equipment on site must be undertaken in the Construction Area. The use of detergents for washing shall be restricted to low phosphate and nitrate containing and biodegradable-type detergents. Runoff should be collected, contained, and disposed of at an appropriate hazardous waste site.

(i) Drip Trays and Bunding

- All plant or machinery, which includes but is not limited to generators, pumps, compressors, drill rigs, static plant, shall have drip trays strategically placed to catch incidental spills.

- Drip trays shall be inspected and emptied daily and serviced when necessary. Drip trays shall be closely monitored during rain events to ensure that they do not overflow.
- All repairs done on machinery using hydrocarbons as fuels or lubricants shall have a drip tray placed strategically to avoid incidental spillage.
- All static plant (stationary >6 months) shall be located within a bunded area.

4.4.7 NOISE

Because of the Project Site's desolate location with no urban settlements nearby, it is not envisaged that noise would be an issue during construction. The Contractor should, however, limit noise to acceptable levels to blend in with the ambiance of the environment.

- No amplified sound equipment or music shall be allowed on Site. The use of radios, compact disc players and television sets shall not be permitted unless the volume is kept sufficiently low.
- The Contractor shall only use amplification on Site in emergency situations.
- Appropriate directional and intensity settings are to be maintained on all hooters and sirens.
- No blasting is permitted.
- The contractor must comply with all applicable occupational health and safety noise level requirements.

4.4.8 DUST

The Contractor shall take all reasonable measures to minimise the generation of dust because of construction activities to the satisfaction of the Project Engineer and IEO.

The Contractor's dust management planning shall, as a minimum, take cognisance of the following:

- Speed limits for vehicles on unpaved roads and minimisation of haul distances. The speed limit for light vehicles is 40 km/h and for heavy vehicles 20 km/h.
- Measures to ensure that material loads are properly covered during transportation.
- Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion.
- Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors.
- Reporting mechanism and action plan in case of excessive wind and dust conditions.
- Removal of any vegetation shall be avoided as far as possible, while handling and transport of erodible materials shall be avoided under high wind conditions.

- During high wind conditions, the IEO or Project Engineer will evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level. Where possible, stockpiles shall be in sheltered areas. Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the IEO and Resident Engineer.
- The use of water for dust suppression is not recommended.

4.4.9 LIGHTS

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding environment.

4.4.10 SITE STRUCTURES

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on users of the area and the size of area disturbed.

4.4.11 GROUNDWATER

Abstracted groundwater is the only source of water on the Project Site. Groundwater resources are limited and no wastage will be tolerated.

4.5 POST CONSTRUCTION

4.5.1 RIPPING OF COMPACTED SOIL

All areas where soil has been compacted due to construction activities must be ripped in two perpendicular directions to a depth of 0.15m.

4.5.2 SITE REHABILITATION

The site must be cleared of all construction equipment, waste and associated materials by the end of the construction phase of the project.

Areas that were cleared for construction purposes should be restored to its original condition.

Stockpiled topsoil and indigenous vegetation should be used for all rehabilitation purposes. The rehabilitation plan must ensure that erosion by runoff water does not occur.

4.5.3 MEASUREMENT AND PAYMENT

No separate measurement and payment will be made to cover the costs of complying with the EMP and such costs shall be deemed to be covered by the rates tendered for the items in the Schedule of Quantities completed by the Contractor when submitting his tender.

5 MITIGATION MEASURES AND PROPOSED MANAGEMENT PROGRAMME

The table below outlines those specific mitigation measures required to fulfil the recommendations. These measures must be implemented during the construction phase (including future construction). The responsibility for these measures is included in Column IV.

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
PLANNING & DESIGN				
Contractor Requirements	Ensure that the Contractor is aware of his/her responsibility.	Provide the contractor with the EMP.	Proponent Project Engineer	
Independent Environmental Officer (IEO)	Ensure that activities on site are compliant with the requirements of the EMP.	Appoint an Independent Environmental Officer to oversee environmental aspects of the development.	Proponent Project Engineer	
Waste Management	Ensure the effective and efficient separation, storage and removal of waste from the site.	Develop a Waste Management Plan for the construction phase which will detail: Schedules for collection; Responsible parties for collection; Details regarding waste separation (hazardous vs. general); Provision of facilities for the separation and storage of waste; Details regarding the disposal of the waste (hazardous and general); Assigns responsibilities for these activities.	Project Engineer Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Loss of biodiversity and habitat destruction	Be aware of protected flora species that may not be damaged or removed without a permit.	An Ecologist/Botanist should be involved in an advisory position during the planning and design of the project to identify protected species that must be removed or transplanted.	Proponent Botanist IEO Contractor	
	Be aware of protected fauna and avifauna species that might be threatened by the solar park development.	An Ecologist should be involved in an advisory position during the construction phase of the project.	Proponent Ecologist IEO Contractor	
	Be aware of bird mortalities associated with powerlines.	Horizontal configured designs experience more problems with bird streamers than vertically configured designs.	Contractor	
		Make provision for anti-collision mechanisms.	Contractor	
	Make provision for adequate gaps between wires on power lines	Contractor		
	Be aware of bird mortalities associated with solar parks	Solar Panels must be visible to birds as structures.	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Loss of biodiversity and habitat destruction	Be aware of electrocution of animals.	Plan for electro static animal guards on the bushings.	Contractor	
		Pole mounted transformers and bushings can be insulated.	Contractor	
		Substations must be equipped with electric fencing to prevent baboons entering such areas.	Contractor	
	Be aware of interference of security fence with small animal movement	Do not electrify strands around the solar plant lower than 20 cm from the ground.	Contractor	
SITE ESTABLISHMENT				
Construction activities	Be aware of protected flora species that may not be damaged or removed without a permit.	A layout plan for construction activities needs to be developed and approved by the Environmental Site Manager.	Proponent Project Engineer IEO Contractor	
		Ensure that there is no unnecessary disturbance to areas on the site and that construction activities take environmental considerations into account.	Project Engineer IEO Contractor	
Construction Area	Ensure that the Construction	Portable, chemical toilets and	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
	Area does not pollute the environment.	potable water must be provided for the construction personnel.		
Soil	Ensure preservation of the topsoil.	Topsoil stockpiles must be established in disturbed zones.	Contractor	
	Ensure that erosion impacts are kept under control.	Areas scheduled for construction to be cleared only 1 week prior to construction.	Contractor	
Training	Improve the awareness of all construction personnel regarding environmental matters.	Develop and implement a training programme to address environmental issues and responsibilities.	IEO Contractor	
CONSTRUCTION				
Independent Environmental Officer	Ensure that there is compliance with the EMP on site.	An Independent Environmental Officer may inspect the site any time during construction phase.	IEO	
Effect of the EMP	Ensure that the EMP is enforced on all contractors.	Each contractor and subcontractor to be notified and bound by content of this EMP.	Project Engineer IEO Contractor(s)	
Archaeological Evidence	Ensure the protection of archaeological sites.	Construction must be stopped, and a professional archaeologist consulted should any archaeological remains be uncovered.	Contractor IEO Archaeologist	
Borrow Pits	Ensure that the soil resources are not over exploited.	No borrow pit may be excavated from any sensitive or open	Contractor IEO	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
		space areas.		
Cleaning of equipment	Ensure that spillages are minimised and that where these occur, that they are appropriately managed.	Proper cleaning trays should be used for the cleaning of cement mixing and handling equipment.	Contractor	
Communication	Ensure that interested and affected parties are provided with a medium through which to lay complaints regarding activities on site.	A complaints register should be kept in the site office.	Contractor	
		The IEO needs to be informed of all complaints and corrective action to be taken.		
Contaminated Soil	Ensure that soils that are contaminated do not pollute the environment.	All soils that have been contaminated by fuel spills, paints spills, etc. must be appropriately removed from the site.	Contractor	
General waste	Ensure that the site remains clean and clear of litter.	All litter must be collected into rubbish bins located on the site. These bins must be regularly (i.e. weekly) collected and transported to a registered waste disposal facility.	Contractor	
Ground Water	Prevent the contamination of	Vehicles must be equipped with	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
	groundwater resources.	drip trays to prevent spillages of oils and fuels.		
Dust	Ensure dust does not cause nuisance to the environment.	Speed limits for vehicles covered material loads properly during transportation. Minimisation of the disturbed areas at any one time. Proper location and treatment of material stockpiles. Avoid Removal of vegetation as far as possible. The use of water for dust suppression is not recommended.	Contractor	
Loss of biodiversity and habitat destruction	Ensure that there is no unnecessary disturbance to Project site and that construction activities take environmental considerations into account.	Protected, medicinal and/or sensitive plants that are likely to be destroyed or affected by construction activities should be relocated to more suitable areas.	Botanist IEO Contractor	
Soil	Ensure that storm water do not erode the topsoil stockpile.	Construct and maintain a berm around topsoil stockpiles.	Contractor	
Installation of	Ensure that all points for water provision are regularly inspected	Implement adequate mitigating measures to curtail any erosion	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Services	for erosion impacts.	impacts.		
	Ensure that water used to wash machinery and any other “grey” water does not pollute the site.	Provide a wash bay with an impermeable floor to contain such water.	Contractor	
Noise	Ensure that nuisance noise from construction activities are at acceptable levels.	The contractor must comply with all applicable occupational health and safety noise level requirements	Contractor	
Road Works and Traffic	Ensure that travellers are not inconvenienced by the movement of construction vehicles off-site.	Notices should be placed on the access road during the construction period indicating that heavy vehicles are using the road.	Contractor	
Safety & Security	Ensure the safety and security of staff and the public.	All local authority by-laws must be adhered to.	Contractor	
		All contractors must take cognisance of and abide by the Occupational Health and Safety Act.	Contractor	
		No movement of construction workers through the neighbouring area.	Contractor	
Storage Facilities	Ensure that hazardous materials are stored according to	Specifically, designed storage facilities need to be provided	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
	legislative requirements.	and used for hazardous materials.		
	Ensure that fuel stored on site does not pose a pollution and fire hazard.	No fuel to be stored on site, but if necessary it shall be banded to 110% of the capacity of the largest container.	Contractor	
Storm Water Run-off	Ensure that run-off does not contribute to erosion & siltation.	Construct and maintain berms on the site to contain storm water run-off or establish riffle beds or retention ponds, as appropriate.	Contractor	
Vehicle repairs	Ensure that spillages are minimised and that where these occur, that they are managed appropriately.	Vehicle repairs on site, must take place on appropriate work surface and may only take place within the provided area in the Construction Area	Contractor	
Waste	Ensure the adequate management of waste.	No waste should be burnt on site.	Contractor	
	Ensure the adequate removal of solid waste.	All wastes (hazardous or general) must be collected and disposed of at an appropriate registered facility.	Contractor	
Waste	Ensure the adequate management of waste	Refuse shall be disposed of into scavenger- (baboons, dogs,	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
		rodents, etc.) and weather-proof bins. The Contractor shall then remove the refuse collected from the working areas, from Site at least once a week or depending on necessity. Refuse must be disposed of at an appropriate landfill site.		
POST CONSTRUCTION				
Site Rehabilitation	Ensure the site is left clean, orderly and free of rubble after construction activities.	Remove all rubble, rubbish, litter, unused building equipment, contaminated soils or any other relevant articles from the site following the end of the construction phase.	Contractor IEO Botanist	
Soil	Promote the rehabilitation of the site back to its original condition as far as possible.	Soil that has been compacted during construction activities must be ripped in two perpendicular directions.	Project Engineer Contractor	
	Ensure the re-use of top soil for rehabilitation.	Top soil that is stockpiled on site must be used to rehabilitate the disturbed areas.	Project Engineer Contractor	
Vegetation	Promote replanting of endemic species associated with the	Plant species that had to be removed/damaged during	IEO Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
	area.	construction should be replanted.		
MONITORING				
Audit Reports	Ensure adequate reporting of progress with the development	Regular reports, monthly and construction end are proposed, and should be forwarded to the DEA.	IEO	
Monitoring	Ensure compliance with the requirements of the EMP.	Undertake monitoring activities monthly.	IEO	

APPENDIXES

APPENDIX A

LOCALITY MAP

APPENDIX B

PENALTIES

SCHEDULE OF PENALTIES FOR ENVIRONMENTAL DAMAGE OR EMP TRANSGRESSIONS

Note: The maximum penalty for any environmental damage will never be less than the cost of applicable environmental rehabilitation.

EMP TRANSGRESSION OR RESULTANT ENVIRONMENTAL DAMAGE	MIN (N\$)	MAX (N\$)
Failure to report environmental damage or EMP transgressions to the ECO or Engineer.	2,500.00	5,000.00
Failure to carry out instructions of the ECO or Engineer regarding the environment or the EMP.	2,500.00	5,000.00
Failure to comply with prescriptions for securing of loads to ensure safe passage of delivery vehicles.	2,500.00	5,000.00
Failure to comply with prescriptions for the storage of imported materials within a designated contractor's yard.	2,500.00	5,000.00
Failure to comply with prescribed administration, storage or handling of hazardous substances.	5,000.00	10,000.00
Failure to comply with fuel storage, refuelling, or clean-up prescriptions.	5,000.00	10,000.00
Failure to comply with prescriptions for the use of ablution facilities.	2,500.00	5,000.00
Failure to comply with prescriptions for the use of designated eating areas, heating source for cooking or presence of fire extinguishers	2,500.00	5,000.00
Failure to comply with prescriptions regarding water provision.	2,500.00	5,000.00
Failure to comply with prescriptions regarding fire control.	2,500.00	5,000.00
Failure to comply with prescriptions for waste management (incl. paint chips, cement and concrete).	2,500.00	5,000.00
Failure to comply with prescriptions to prevent water pollution.	5,000.00	10,000.00
Failure to comply with prescriptions regarding workshop equipment maintenance and storage.	2,500.00	5,000.00

EMP TRANSGRESSION OR RESULTANT ENVIRONMENTAL DAMAGE	MIN (N\$)	MAX (N\$)
Failure to comply with prescriptions regarding noise levels of construction activities.	2,500.00	5,000.00
Failure to comply with prescriptions regarding working hours.	2,500.00	5,000.00
Failure to comply with prescriptions regarding lighting and aesthetics.	2,500.00	5,000.00
Failure to comply with prescriptions regarding silt, debris and other obstruction removal.	2,500.00	5,000.00
Failure to comply with prescriptions regarding water diversion and drainage.	2,500.00	5,000.00
Failure to comply with prescriptions regarding erosion and scour protection.	2,500.00	5,000.00
Failure to comply with prescriptions regarding traffic accommodation.	2,500.00	5,000.00
Failure to comply with prescriptions regarding tree and vegetation removal/damage.	5,000.00	20,000.00
Failure to comply with prescriptions regarding site demarcation and erection of fences.	2,500.00	5,000.00
Failure to comply with prescriptions regarding demarcation and enforcement of 'no go' areas.	2,500.00	5,000.00
Failure to comply with prescriptions regarding control of vehicles and plant on access routes.	2,500.00	5,000.00
Failure to comply with prescriptions regarding information posters	2,500.00	5,000.00
Failure to comply with prescriptions regarding procedures for emergencies.	2,500.00	5,000.00
Failure to comply with prescriptions regarding information boards or a complaints register.	2,500.00	5,000.00
Failure to comply with prescriptions regarding protection of natural features.	5,000.00	20,000.00
EMP TRANSGRESSION OR RESULTANT ENVIRONMENTAL DAMAGE	MIN (N\$)	MAX (N\$)
Failure to comply with prescriptions regarding erosion and sedimentation control.	2,500.00	5,000.00
Failure to comply with prescriptions regarding protected	5,000.00	20,000.00

areas.		
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For each subsequent similar offence committed by the Contractor, the penalty shall be doubled in value to a maximum value of N\$ 50,000.00.

APPENDIX C

PRO-FORMA ENVIRONMENTAL MONITORING REPORT

ESM ENVIRONMENTAL MONITORING REPORT

Report No:.....

Date:.....

Method Statements	Contractor:	Date received:

Environmental Education	Contractor:	Date undertaken:

Issue	Observation	Remedial action	Compliance
1 Construction			
1.1 All plant, personnel, etc. restricted to works area?			
1.2 Contractor's Camp located in area of low environmental sensitivity as indicated by the Engineer?			
1.3 Where needed, sensitive areas adequately fenced off?			
1.4 Fencing well maintained?			
Issue	Observation	Remedial action	Compliance
1.5 No unauthorised entry,			

stockpiling, etc. outside work areas?			
1.6 All vehicles and plant remain on designated routes?			
1.7 Information posters put up and maintained where needed?			
1.8 No smoking in hazardous areas?			
1.9 Basic firefighting equipment available on Site?			
1.10 No burning of wastes as a means of disposal?			
1.11 Staff aware of procedures in the event of spills/leaks?			
Issue	Observation	Remedial action	Compliance
1.12 Materials for dealing with spills/leaks available?			
1.13 Emergency contact numbers displayed at Contractor's office?			

1.14 Complaints Register up to date?			
1.15 Archaeological material found on Site mitigated?			
1.16 No animals trapped or harmed?			
1.17 No flora removed or damaged outside work areas?			
1.18 Adequate drainage and retaining works in place to control erosion/siltation?			
1.19 Restricted traffic over stabilised areas?			
Issue	Observation	Remedial action	Compliance
1.20 No concrete mixing on bare ground?			
1.21 Concrete batching restricted to area of low environmental sensitivity?			
1.22 All wastewater from concrete mixing area disposed of via wastewater management system?			

1.23 Concrete mixing area kept neat and clean?			
1.24 Suitable screening and containment of cement silos?			
1.25 All visible remains of excess concrete removed on completion of concrete work?			
1.26 No pollution from drilling operations?			
Issue	Observation	Remedial action	Compliance
1.27 Location and rescue of plants undertaken by suitably qualified contractor?			
1.28 Rescued plants moved to nursery if direct transplantation not possible?			
1.29 After vegetation clearance, all unstable areas are properly stabilised?			
1.30 Cleared vegetation properly disposed of?			
1.31 All wastes removed from cleared area and			

disposed of?			
1.32 Mulched vegetation stored in bags?			
1.33 Fertilisers containing phosphates not used?			
Issue	Observation	Remedial action	Compliance
1.34 No planting undertaken where construction works have not yet been finished?			
1.35 No unauthorised traffic on revegetated areas?			
2 Materials			
2.1 Construction materials adequately secured to ensure safe deliveries?			
2.2 All materials being stored inside Contractor's Camp?			
2.3 All imported materials free of weeds, litter, etc.?			
2.4 Stockpile areas approved?			
2.5 Topsoil stripped and stockpiled at a suitable site prior to earthworks?			

Issue	Observation	Remedial action	Compliance
2.6 No spoil stockpiled outside agreed areas?			
2.7 Spoil stockpiles correctly shaped and protected?			
2.8 All plants used for landscaping/rehabilitation listed in the approved plant list?			
2.9 Plants adequately protected during transit and at storage facilities?			
2.10 Plants healthy and free from diseases and pests?			
3 Plant			
3.1 Fuel/oil storage facilities adequately secured and protected against leakage?			
3.2 Safety signage provided at fuel storage areas?			
Issue	Observation	Remedial action	Compliance
3.3 All electrical/petrol pumps suitably equipped and placed not cause any			

danger of ignition?			
3.4 Fuel storage areas comply with fire safety regulations?			
3.5 Necessary authorisations obtained for temporary above ground fuel tanks?			
3.6 Capacity of a fuel tank does not exceed 9000 l?			
3.7 Fuel tanks erected at least 3.5 m away from buildings, boundaries or other flammable materials?			
3.8 Adequate toilet facilities provided for staff (min. 1 toilet per 30 workers)?			
Issue	Observation	Remedial action	Compliance
3.9 Toilets adequately maintained?			
3.10 All workers use toilets?			
3.11 Scavenger-proof bins with lids provided at eating areas?			

3.12 Waste temporarily stored inside Contractor's Camp in weather- and scavenger-proof bins?			
3.13 No burying or dumping of wastes on site?			
3.14 Waste management system in place?			
3.15 Refuse disposed of at licensed landfill?			
3.16 Adequate waste-water management system in place?			
Issue	Observation	Remedial action	Compliance
3.17 Approval for discharge of contaminated water into municipal sewer system?			
3.18 Runoff from workshops, fuel depots, etc. directed into conservancy tanks for disposal at approved site?			
3.19 Wash areas placed and built in such a way that does not cause any pollution?			

3.20 All maintenance of plant and equipment takes place in workshop?			
3.21 All plant is well maintained (no leaking)?			
3.22 Workshop has a bunded, impermeable floor sloping towards oil trap?			
3.23 Contractor's Camp tidy?			
Issue	Observation	Remedial action	Compliance
3.24 All plant and machinery have drip trays, which are checked and emptied daily?			
3.25 All repairs on machinery using fuels or lubricants done over a drip tray?			
3.26 Static plant located within a bunded area?			
3.27 Measures in place to minimise dust generation?			
3.28 No handling/transport of erodible materials under high wind conditions?			

EMP Transgressions	Contractor:	Date:	Fine issued:

Complaints	Date received:	Action taken:

Other issues	

APPENDIX D

PRO-FORMA METHOD STATEMENT

METHOD STATEMENT

CONTRACT:

DATE:

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 works)

START AND END DATE OF WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED

Start Date:

End Date:

HOW ARE THE WORKS TO BE UNDERTAKEN? (provide as much detail as possible, including annotated sketches and plans where possible) *Note: please attach extra pages if more space is required.