

# Annexure F: Environmental Management Plan

# Environmental Management Plan

**PROPOSED CONSTRUCTION OF AN 18MW SOLAR POWER  
PLANT ON LEASE 16 OF FARM 38, WALVIS BAY, ERONGO  
REGION**

## PROJECT DETAILS

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## ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
DR	Developer's Representative
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HIV	Human Immuno-deficiency Virus

I&APs	Interested and Affected Parties
NHC	National Heritage Council
Reg.	Regulation
S	Section
TB	Tuberculosis

## 1 INTRODUCTION

Namibia is regarded as a net exporter of electricity, local electricity generation is derived from hydropower, coal and diesel burning power stations; however this is not enough to meet local demand (INCUNFCC, 2002) necessitating the country to source the balance, amounting to more than 60%, from other countries within the Southern African region such as Zambia, South Africa, Zimbabwe and Mozambique; of which South Africa's contribution is dominant at 53% (von Oertzen, 2012). Despite the current situation, the energy consumption in Namibia follows an upward trajectory because of the unavoidable dependency of national development on the availability, supply, demand and use of energy (Ajayi & Ajayi, 2013). Namibia will thus have to develop, as a matter of urgency, its own capacity to generate electricity (Kapika & Eberhard, 2010).

It is against this background that Euarestos Asset Management, the proponent, has embarked on this opportunity to contribute towards energy self-sufficiency and efficiency by constructing an 18MW Solar Power Plant at Farm 38 in town of Walvis Bay in the Erongo Region. The Municipality of Walvis Bay has allocated the proponent a 29 ha portion of Farm 38 for this purpose. It is otherwise known as Lease No.16 of the Farm No.38, Walvis Bay.

The proponent appointed Environam Consultants Trading cc (ECT) to undertake the Environmental Assessment (EA) in order to obtain an Environmental Clearance Certificate (ECC) for the activity from the Office of the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

The process will be undertaken in terms of the gazetted Namibian Government Notice No. 30 Environmental Impact Assessment Regulations (herein referred to as EIA Regulations) of the Environmental Management Act (No 7 of 2007) (herein referred to as the EMA). The EIA process will investigate if there are any potential significant bio-physical and socio-economic impacts associated with the proposed development and related infrastructure and services.

The EIA process would also provide an opportunity for the public and key stakeholders to provide comments and participate in the process. It will also serve the purpose of informing the proponent's decision-making, and that of MEFT.

An EMP is one of the most important outputs of the EA process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. This EMP details the mitigation and monitoring actions to be implemented during the following phases of this development:

- Planning and Design - the period, prior to construction, during which preliminary legislative and administrative arrangements, necessary for the preparation of the land, are made and engineering designs are carried out. The preparation of construction tender documents forms part of this phase;

- Construction - the period during which the proponent, having dealt with the necessary legislative and administrative arrangements, appoints a contractor for the construction of services infrastructure, buildings as well as any other construction process(s) within the development areas;
- Operation and Maintenance - the period during which the development will be fully functional, operational and maintained.

The decommissioning of this development is not envisaged; however in the event that this should be considered some recommendations have been outlined in **Table 5-4**.

## 2 ROLES AND RESPONSIBILITIES

Euarestos Asset Management (the Developer) is ultimately responsible for the implementation of the EMP, from the planning and design phase to the decommissioning phase of this development, if the development is in future decommissioned. The developer will delegate this responsibility as the project progresses through its life cycle. The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals:

- Developer's Representative;
- Environmental Control Officer; and
- Contractor (Construction and Operations and Maintenance).

### 2.1 DEVELOPER'S REPRESENTATIVE

The Developer should assign the responsibility of managing all aspects of this development for all development phases (including all contracts for work outsourced) to a designated member of staff, referred to in this EMP as the Developer's Representative (DR). The Developer may decide to assign this role to one person for the full duration of the development, or may assign a different DR to each of the development phases - i.e. one for the planning and design phase, one for the construction phase and one for the operation and maintenance phase. The DR's responsibilities are depicted in **Table 2-1** as follows:

**Table 2-1: DR's responsibilities**

Responsibility	Project Phase
Making sure that the necessary approvals and permissions laid out in <b>Table 4-1</b> are obtained/adhered to	Throughout the lifecycle of this development
Making sure that the relevant provisions detailed in <b>Table 5-1</b> are addressed during planning and design phase.	Planning and design phase
Suspending/evicting individuals and/or equipment not complying with the EMP	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Operation and maintenance</li> </ul>
Issuing fines for contravening EMP provisions	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Operation and maintenance</li> </ul>

## 2.2 ENVIRONMENTAL CONTROL OFFICER

The DR should assign the responsibility of overseeing the implementation of the whole EMP on the ground during the construction and operation and maintenance phases to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The DR/Developer may decide to assign this role to one person for both phases, or may assign a different ECO for each phase. During the operation phase the Developer may outsource the monitoring and evaluation of the EMP to an independent Environmental Consultant. The ECO will have the following responsibilities during the construction and operation and maintenance phases of these developments:

- Management and facilitation of communication between the Developer, DR, the contractors, and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting site inspections (recommended minimum frequency is monthly) of all construction and/or infrastructure maintenance areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Assisting the Contractor in finding solutions with respect to matters pertaining to the implementation of this EMP;
- Advising the DR on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the DR with respect to the issuing of fines for contraventions of the EMP; and

- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

### 2.3 CONTRACTOR

Contractors appointed by the Developer are automatically responsible for implementing all provisions contained within the relevant chapters of this EMP. Contractors will be responsible for the implementation of this EMP applicable to any work outsourced to subcontractors. **Table 5-2** applies to contractors appointed during the construction phase and **Table 5-3** to those appointed during the operation and maintenance phase. In order to ensure effective environmental management the aforementioned chapters should be included in the applicable contracts for outsourced construction, operation and maintenance work.

The tables in **Chapter 5** detail the management measures associated with the roles and responsibilities that have been laid out in this chapter.

## 3 ASSUMPTIONS AND LIMITATIONS

This EMP has been drafted based on the scoping-level Environmental Assessment (EA) conducted for the proposed development as represented by the developer. ECT will not be held responsible for the potential consequences that may result from any alterations to the initial layout.

It is assumed that construction labourers will be sourced mostly from the Gobabis area and that migrant labourers (if applicable) will be housed within the town of Gobabis.

## 4 APPLICABLE LEGISLATION

Legal provisions that have relevance to various aspects of this development are listed in **Table 4-1** below. The legal instrument and applicable corresponding provisions are provided.

**Table 4-1:** Legal provisions relevant to this development

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	Article 91 (c) provides for duty to guard against “the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia.”  Article 95(l) deals with the “maintenance of ecosystems, essential ecological processes and biological diversity” and sustainable use of the country’s natural resources.	Sustainable development should be at the forefront of this development.
Environmental Management Act No. 7 of 2007 (EMA)	Section 2 outlines the objective of the Act and the means to achieve that.	The development should be informed by the EMA.



LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
	Section 3 details the principle of Environmental Management	
EIA Regulations GN 28, 29, and 30 of EMA (2012)	GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate. GN 30 provides the regulations governing the environmental assessment (EA) process.	<b>Activity 1 (a)</b> The generation of electricity. <b>Activity 1 (b)</b> The transmission and supply of electricity.
Convention on Biological Diversity (1992)	Article 1 lists the conservation of biological diversity amongst the objectives of the convention.	The project should consider the impact it will have on the biodiversity of the area.
Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008)	Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process.	The EA process should incorporate the aspects outlined in the guidelines.
Namibia Vision 2030	Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets.	Care should be taken that the development does not lead to the degradation of the natural beauty of the area.
Water Act No. 54 of 1956	Section 23(1) deals with the prohibition of pollution of underground and surface water bodies.	The pollution of water resources should be avoided during construction and operation of the development.
The Ministry of Environment, Forestry and Tourism (MEFT) Policy on HIV & AIDS	MEFT has developed a policy on HIV and AIDS. In addition it has also initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments.	The proponent and its contractor/s have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a significant risk is created when construction workers interact with local communities.
Urban and Regional Planning Act (Act of 2018).	Urban and Regional Planning Act (Act of 2018) regulates subdivisions of portions of land falling within a proclaimed Local Authority area.	Section 16 of Chapter 3 deals with the Ministers' declaration of authorised planning authorities and establishment of joint committees.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council. Sections 34-47 make provision for the aspects of water and sewerage.	The development has to be comply with the provisions of the Local Authorities Act
Labour Act no 11 of 2007	Chapter 2 details the fundamental rights and protections. Chapter 3 deals with the basic conditions of employment.	Given the employment opportunities presented by the development, compliance with the labour law is essential.
Public Health Act no 36 of 1919	Section 119 prohibits persons from causing nuisance.	The developer and contractors are to comply with these legal requirements.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
Nature Conservation Ordinance no 4 of 1975	Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants have to be managed within the legal confines.
Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).	The Ordinance objective is to provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.	All activities on the site will have to take due consideration of the provisions of this legislation.
Roads Ordinance 17 of 1972	This Ordinance consolidates the laws relating to roads.	The provisions of this legislation have to be taken into consideration in as far as access to the development site is concerned.
Roads Authority Act, 1999	Section 16(5) of this Act places a duty on the Roads Authority to ensure a safe road system.	Some functions of the Roads Ordinance 17 of 1972 have been assigned to the Roads Authority.
Walvis Bay Town Planning Scheme.	The town planning scheme has as its general purpose the co-ordinated and harmonious development of the local authority area, or the area or areas situate therein.	Farm 38 is zoned as "Undetermined" in terms of the Walvis Bay Town Planning Scheme.

## 5 MANAGEMENT ACTIONS

The aim of the management actions in this chapter of the EMP is to avoid potential impacts where possible. Where impacts cannot be avoided, measures are provided to reduce them.

The following tables provide the management actions recommended to manage the potential impacts rated in the scoping-level EA conducted for this development. These management actions have been organised temporally according to project phase:

- Planning and design phase management actions (**Table 5-1**);
- Construction phase management actions (**Table 5-2**);
- Operation and maintenance phase management actions (**Table 5-3**);
- Decommissioning phase management actions (**Table 5-4**).

The responsible persons at the Developer's team have assessed these commitments in detail and have committed to the specific management actions where indicated in the tables below.

### 5.1 PLANNING AND DESIGN PHASE

The DR should ensure that the management actions detailed below in **Table 5-1** are adhered to during the period before the construction of the infrastructure starts.

**Table 5-1:** Planning and design management actions

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
Environmental monitoring and Evaluation	<ul style="list-style-type: none"> <li>• An Environmental Practitioner should monitor the implementation of the EMP, and recommend any changes to this document when necessary.</li> <li>• The Environmental Practitioner should inspect the site on a regular basis (preferably monthly or bi-monthly).</li> <li>• Biannual reports are to be submitted to the Environmental Commissioner.</li> </ul>
Surface and Ground Water	<ul style="list-style-type: none"> <li>• Appoint professional engineers to develop a detailed storm water management design as part of the infrastructure service provision of the development.</li> <li>• The service infrastructure should be designed and constructed by suitably qualified engineering professionals.</li> <li>• Develop and implement a preventative maintenance plan for the service infrastructure.</li> <li>• No dumping of waste products of any kind in or in close proximity to any water bodies.</li> <li>• Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment.</li> <li>• Wastewater should not be discharged directly into the environment.</li> <li>• Disposal of waste from the development should be properly managed.</li> </ul>
Land Use	<ul style="list-style-type: none"> <li>• Maintain the small shrubs found on the site and only remove vegetation that has an impact on the development.</li> <li>• Do not use herbicides to manage plant growth.</li> <li>• Introduce additional vegetation and landscaping to supplement lost vegetation.</li> <li>• Clearly demarcate or fence off the plant area to prevent unwanted movement of people and animals into the site.</li> </ul>
Fauna and Flora	<ul style="list-style-type: none"> <li>• Adapt the proposed development to the local environment - e.g. small adjustments to the site layout to avoid potential features such as existing vegetation.</li> </ul>

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>Plant local indigenous species of flora as part of the landscaping as these species would require less maintenance than exotic species.</li> <li>Prevent the introduction of potentially invasive alien ornamental plant species such as; Lantana, Opuntia, Prosopis, Tecoma, etc. as part of the landscaping as these species could infestate the area further over time.</li> </ul>
Existing Service Infrastructure	<ul style="list-style-type: none"> <li>Ensure professional design and construction of service infrastructure from qualified and registered engineers.</li> <li>Ensure consultation and compliance with relevant authorities responsible for services, such as the Municipality, Erongo Red and Namwater.</li> <li>It is recommended that electricity demand for the operations be met with the same technology utilised in generation.</li> <li>Designs and building materials should be as such to reduce dependency on artificial heating and cooling in order to limit the overall energy demand.</li> <li>Water saving mechanisms should be incorporated within the proposed development's design and plans in order to further reduce water demands.</li> <li>Re-use of treated waste water should be considered wherever possible to reduce the consumption of potable water.</li> <li>Train employees on the importance of water and energy savings.</li> <li>Adhere to water quality guidelines in terms of The Water Act, 1956.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>Ensure that road junctions have good sightlines.</li> <li>Limit the type of vehicles to use the internal roads e.g. heavy trucks.</li> <li>Adhere to the speed limit.</li> <li>Implement traffic control measures where necessary.</li> </ul>

## 5.2 CONSTRUCTION PHASE

The management actions listed in Table 5-2 apply during the construction phase. This table may be used as a guide when developing EMPs for other construction activities within this development area.

**Table 5-2:** Construction phase management actions

<b>CONSTRUCTION PHASE IMPACTS</b>	
<b>Impact</b>	<b>Mitigation Measures</b>
Fauna and flora	<ul style="list-style-type: none"> <li>• Prevent contractors from collecting wood, veld food, etc. during the construction phase.</li> <li>• Do not clear cut the entire development site, but rather keep the few individuals shrubs not directly affecting the development as part of the landscaping.</li> <li>• Transplant removed vegetation where possible, or plant new trees in lieu of those that have been removed.</li> </ul>
Pressure on existing infrastructure	<ul style="list-style-type: none"> <li>• Educate workforce on water saving measures.</li> <li>• Ensure all potable water points are metered and regularly read.</li> <li>• Ensure that the workforce is provided with temporary toilets during the construction phase.</li> </ul>
Surface and Ground Water	<ul style="list-style-type: none"> <li>• It is recommended that construction takes place outside of the rainy season in order to limit flooding on site and to limit the risk of ground and surface water pollution.</li> <li>• No dumping of waste products of any kind in or in close proximity to water bodies.</li> <li>• Heavy construction vehicles should be kept out of any surface water bodies and the movement of construction vehicles should be limited where possible to the existing roads and tracks.</li> <li>• Ensure that oil/ fuel spillages from construction vehicles and machinery are minimised and that where these occur, that they are appropriately dealt with.</li> <li>• Drip trays must be placed underneath construction vehicles when not in use to contain all oil and spillages that might be leaking from these vehicles.</li> <li>• Contaminated runoff from the construction sites should be prevented from entering the surface and ground water bodies.</li> <li>• All materials on the construction site should be properly stored.</li> <li>• Disposal of waste from the site should be properly managed and taken to the Walvis Bay landfill site.</li> <li>• Construction workers should be given ablution facilities at the construction site that are located at least 30 m away from any surface water and these should be regularly serviced.</li> <li>• Washing of personnel or any equipment should not be allowed on site. Should it be necessary to wash construction equipment this should be done at an area properly suited and prepared to receive and contain contaminated waters.</li> </ul>

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
Health, Safety and Security	<ul style="list-style-type: none"> <li>• Construction personnel should not overnight at the site, except for security personnel.</li> <li>• Ensure that all construction personnel are properly trained depending on the nature of their work.</li> <li>• Provide for a first aid kit and a properly trained personnel to apply first aid when necessary.</li> <li>• A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases and Covid-19.</li> <li>• Provide free condoms in the workplace throughout the construction phase.</li> <li>• Facilitate access to Antiretroviral medication for construction personnel.</li> <li>• Conform to the stipulated protocols related to Covid-19.</li> <li>• Restrict unauthorised access to the site and implement access control measures.</li> <li>• Clearly demarcate the construction site boundaries along with signage of no unauthorised access.</li> <li>• Clearly demarcate dangerous areas and no go areas on site.</li> <li>• Staff and visitors to the site must be fully aware of all health and safety measures and emergency procedures.</li> <li>• The contractor/s must comply with all applicable occupational health and safety requirements. The workforce should be provided with all necessary Personal Protective Equipment where appropriate.</li> </ul>
Air quality	<ul style="list-style-type: none"> <li>• All loose material should be kept on site for the shortest possible time.</li> <li>• It is recommended that dust suppressants such as Dustex be applied to all the construction clearing activities to minimise dust.</li> <li>• Construction vehicles to only use designated roads.</li> <li>• During high wind conditions the contractor must make the decision to cease works until the wind has calmed down.</li> <li>• Cover any stockpiles with plastic to minimise windblown dust.</li> <li>• Ensure construction vehicles are well maintained to prevent excessive emission of smoke.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• No amplified music should be allowed on site.</li> <li>• Inform neighbouring communities of construction activities to commence and provide for continuous communication between them and contractor.</li> <li>• Limit construction times to acceptable daylight hours.</li> </ul>

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Install technology such as silencers on construction machinery.</li> <li>• Do not allow the use of horns/hooters as a general communication tool, but use it only where necessary as a safety measure.</li> <li>• Provide protective equipment such as ear muffs and ear plugs to workers.</li> <li>• Plan construction around the school programme to minimise disruptions of the school activities.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>• Limit and control the number of access points to the site.</li> <li>• Ensure that road junctions have good sightlines.</li> <li>• Construction vehicles' need to be in a road worthy condition and maintained throughout the construction phase.</li> <li>• Transport the materials in the least amount of trips as possible.</li> <li>• Adhere to the speed limit.</li> <li>• Implement traffic control measures where necessary.</li> <li>• Minimise the movement of heavy vehicles during peak time.</li> <li>• Minimise the movement of vehicles on or close to the C14 Main Road as well as to the D1983.</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>• It is recommended that waste from the temporary toilets be disposed of at the Walvis Bay Wastewater Treatment Works, on a regular basis.</li> <li>• A sufficient number of waste bins should be placed around the site for the soft refuse.</li> <li>• A sufficient number of skip containers for the heavy waste and rubble should be provided for around the site.</li> <li>• The waste containers should be able to be closed to prevent birds and other animals from scavenging.</li> <li>• Solid waste will be collected and disposed off at an appropriate local landfill in Walvis Bay, in consultation with the local authority.</li> </ul>
Hazardous Substances	<ul style="list-style-type: none"> <li>• All chemicals and other hazardous substances must be stored and maintained in accordance with the Hazardous Substances Ordinance (No. 14 of 1974), with all relevant licences and permits to be obtained where applicable.</li> </ul>

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>Given the potential harm to human health during handling and use of any of hazardous substances it is essential that all staff be trained with regards to the proper handling of these substances as well as First Aid in the case of spillage or intoxication.</li> <li>Storage areas for all substances should be bunded and capable to hold 120% of the total volume of a given substance stored on site.</li> </ul>
Social	<ul style="list-style-type: none"> <li>Ensure locals enjoy priority in terms of job opportunities, to the extent possible, for skills that are available locally.</li> <li>Ensure local procurement where commodities are available locally.</li> </ul>

### 5.3 OPERATION AND MAINTENANCE PHASE

The management actions included in Table 5-3 below apply during the operation and maintenance phase of this development.

**Table 5-3:** Operation and maintenance management actions

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
Surface and Ground Water	<ul style="list-style-type: none"> <li>A no-go buffer area of at least 30 m should be allocated to any water bodies in the area.</li> <li>No dumping of waste products of any kind in or in close proximity to any water bodies.</li> <li>Contaminated runoff from the various operational activities should be prevented from entering any water bodies.</li> <li>Should it be necessary to wash equipment such as panels, wastewater should be prevented from contaminating ground or any surface water sources.</li> <li>Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment.</li> </ul>



<b>OPERATIONAL PHASE IMPACTS</b>	
<b>Impact</b>	<b>Mitigation Measures</b>
	<ul style="list-style-type: none"> <li>• Wastewater should not be discharged directly into the environment.</li> <li>• Disposal of waste from the development should be properly managed and taken to the relevant disposal facilities.</li> <li>• Bi-annual monitoring of erosion especially in the vicinity of PV arrays should be conducted regularly to ensure erosion sites can be identified and remedied early enough.</li> <li>• Ensure that oil/ fuel spillages from vehicles and machinery are minimised and that where these occur, that they are appropriately dealt with.</li> <li>• Ensure regular inspections and maintenance of equipment.</li> <li>• All materials on the site should be properly stored.</li> <li>• Disposal of waste from the site should be properly managed and taken to an approved landfill site.</li> <li>• Ablution facilities at the site should not allow any possible contact with ground water resources. These facilities should be regularly serviced.</li> <li>• Site equipment should be refueled in paved areas with a collection point in case of any spillage.</li> <li>• The service infrastructure should be designed and constructed by suitably qualified engineering professionals.</li> <li>• Develop and implement a preventative maintenance plan for the service infrastructure.</li> </ul>
Visual and Sense of Place	<ul style="list-style-type: none"> <li>• It is recommended that more ‘green’ technologies be implemented within the architectural designs and building materials of the development where possible in order to minimise the visual prominence of such a development within the more natural surrounding landscape.</li> <li>• Natural colours and building materials such as wood and stone should be incorporated.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• Limit the types of activities that generate excessive noise.</li> <li>• All areas where noise levels are above 85 dB should be managed and controlled in accordance with the relevant guidelines.</li> <li>• Continuous monitoring of noise levels should be conducted to make sure the noise levels do not exceed acceptable limits.</li> </ul>

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Maintain equipment used during the operation and keep them in a good state such that they do not emit excessive noise.</li> <li>• No activity having a potential noise impact should be allowed after 18:00 if possible.</li> </ul>
Impact on human health	<ul style="list-style-type: none"> <li>• Prolonged exposure in the vicinity of transformers should not exceed 1 hour at a distance of not less than 2.62 m.</li> <li>• The prescribed servitudes to be observed.</li> <li>• Placing the transmission line underground as opposed to overhead.</li> </ul>
Health, Safety and Security	<ul style="list-style-type: none"> <li>• Ensure that all personnel are properly trained depending on the nature of their work.</li> <li>• Provide for a first aid kit and a properly trained personnel to apply first aid when necessary.</li> <li>• A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases and Covid-19.</li> <li>• Provide free condoms in the workplace throughout the operational phase.</li> <li>• Facilitate access to Antiretroviral medication for construction personnel.</li> <li>• Conform to the stipulated protocols related to Covid-19.</li> <li>• Restrict unauthorised access to the site and implement access control measures.</li> <li>• Clearly demarcate the construction site boundaries along with signage of no unauthorised access.</li> <li>• Clearly demarcate dangerous areas and no go areas on site.</li> <li>• Staff and visitors to the site must be fully aware of all health and safety measures and emergency procedures.</li> <li>• The contractor/s must comply with all applicable occupational health and safety requirements. The workforce should be provided with all necessary Personal Protective Equipment where appropriate.</li> </ul>
Air quality	<ul style="list-style-type: none"> <li>• The plant operation itself is not expected to give off dust or emissions as compared to the fossil fuel based electricity generation plants, which emit greenhouse gases and other noxious gases.</li> </ul>

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
Waste management	<ul style="list-style-type: none"> <li>• The area will be kept free of waste, except in designated waste storage areas. Any wastes distributed by winds will be regularly cleaned up.</li> <li>• A sufficient number of waste bins should be placed around the site for the soft refuse.</li> <li>• A sufficient number of skip containers for the heavy waste and rubble should be provided for around the site.</li> <li>• Solid waste will be collected and disposed off at an appropriate local land fill.</li> <li>• Place priority on waste reduction, waste reuse and waste recycling, in that order.</li> </ul>
Quality of life	<ul style="list-style-type: none"> <li>• Ensure locals enjoy priority in terms of job opportunities, for skills that are available locally, to the extent possible.</li> <li>• Ensure local procurement where commodities are available locally.</li> </ul>
Infrastructure development	<ul style="list-style-type: none"> <li>• Ensure that the infrastructure is designed and supervised by suitably qualified engineering professionals.</li> </ul>

#### 5.4 DECOMMISSIONING PHASE

The decommissioning of this development is not foreseen. In the event that this development is decommissioned the following management actions in **Table 5-4** should apply.

**Table 5-4:** Decommissioning phase management actions

Environmental Feature	Management Actions
Deconstruction activity	<p>At the end of its useful life, the plant will be completely dismantled so as to restore the area to <i>ante operam</i> conditions. Because each production unit will be uninstalled, the following waste will be produced:</p> <ul style="list-style-type: none"> <li>• Panels: aluminium, glass, cells and polymer waste;</li> <li>• Electricity lines: copper and metallic elements;</li> <li>• Pipes;</li> <li>• Supporting structures: metallic elements;</li> </ul> <p>Unless these materials are disposed of properly, they can cause irreversible damage to the environment (surface and underground water, vegetation and animals), as well as to human health due to pollution of aquifers for example, and the deterioration of environmental conditions.</p>
Rehabilitation	<p>A full decommissioning plan should be developed within the first 24 months of operation, however the following management actions are recommended as a minimum:</p> <ul style="list-style-type: none"> <li>• Reusable, recyclable and scrapable components will be selected.</li> <li>• Disposal will consist of disassembling the modules and sending them to a suitable recycling platform which will carry out the following recovery work: <ul style="list-style-type: none"> <li>➤ recovery of aluminium frames;</li> <li>➤ recovery of glass material;</li> <li>➤ recovery of cells;</li> </ul> </li> </ul>

Environmental Feature	Management Actions
	<ul style="list-style-type: none"> <li>➤ decommissioning of the polymer material covering the cells.</li> <li>• The electricity lines of all the systems such as lighting will be removed by carrying out only the absolute necessary excavation work.</li> <li>• Copper from electricity cables and windings as well as other metallic parts will be sent to specialised centres for recovery and recycling.</li> <li>• Appliances such as inverters, control panels and transformers will be disassembled and sent to specialised companies for disposal.</li> <li>• Piping and electrical drawpits will be removed by excavating a set size excavation and the original situation will be restored using the excavated material.</li> <li>• The exposed parts of the photovoltaic module supporting structures will be removed mechanically, whereas the foundation piles sunk into the ground will be extracted.</li> </ul>

## **Appendix B - Water Quality Guidelines**

# **THE WATER ACT, 1956 (ACT 54 OF 1956 ) AND ITS REQUIREMENTS IN TERMS OF WATER SUPPLIES FOR DRINKING WATER AND FOR WASTE WATER TREATMENT AND DISCHARGE INTO THE ENVIRONMENT**

## **1. INTRODUCTION**

The provisions of the Water Act are intended, amongst other things, to promote the maximum beneficial use of the country's water supplies and to safeguard water supplies from avoidable pollution.

The drinking water guidelines are not standards as no publication in the Government Gazette of Namibia exists to that effect. However the Cabinet of the Transitional Government for National Unity adopted the existing South African Guidelines (461/85) and the guidelines took effect from 1 April 1988 under the signature of the then Secretary for Water Affairs.

The sections of the Water Act that relate to the discharge of industrial effluents are:

- Section 21(1) which states that
  - The purification of waste water shall form an integral part of water usage and
  - that purified effluents shall comply with the General Standard Quality restrictions as laid out in Government Gazette R553 of 5 April 1962 and
- Section 21(2) which further stipulate that this purified effluent be returned as close as possible to the point of abstraction of the original water.

Where a local authority has undertaken the duty of disposing of all effluents from an industrial process the provisions of Section 21(1) and 21(2) apply to the local authority and not the producer of the effluents. If there is difficulty in complying with these provisions then the applicant may apply for an exemption from the conditions in terms of Section 21(5) and 22(2) of the Water Act. The Permanent Secretary after consultation with the Minister may grant the issuance of a Waste Water Discharge Permit under Sections 21(5) and 22(2) subject to such conditions as he may deem fit to impose.

After independence, the Government of the Republic of Namibia decided that for the interim the existing guidelines will continue to be valid and to remain in use until a proper study has been conducted and new standards have been formulated (Article 140 of Act 1 of 1990).

## **2. GUIDELINES FOR THE EVALUATION OF DRINKING-WATER QUALITY FOR HUMAN CONSUMPTION WITH REGARD TO CHEMICAL, PHYSICAL AND BACTERIOLOGICAL QUALITY**

Water supplied for human consumption must comply with the officially approved guidelines for drinking-water quality. For practical reasons the approved guidelines have been divided into three basic groups of determinants, namely:

- Determinants with aesthetic / physical implications: TABLE 1.
- Inorganic determinants: TABLE 2.
- Bacteriological determinants: TABLE 3.

### **2.1 CLASSIFICATION OF WATER QUALITY**

The concentration of and limits for the aesthetic, physical and inorganic determinants define the group into which water will be classified. See TABLES 1 and 2 for these limits. The water quality has been grouped into 4 quality classes:

- Group A: Water with an excellent quality
- Group B: Water with acceptable quality
- Group C: Water with low health risk
- Group D: Water with a high health risk, or water unsuitable for human consumption.

Water should ideally be of excellent quality (Group A) or acceptable quality (Group B), however in practice many of the determinants may fall outside the limits for these groups.

If water is classified as having a low health risk (Group C), attention should be given to this problem, although the situation is often not critical as yet.

If water is classified as having a higher health risk (Group D), urgent and immediate attention should be given to this matter.

Since the limits are defined on the basis of average lifelong consumption, short-term exposure to determinants exceeding their limits is not necessarily critical, but in the case of toxic substances, such as cyanide, remedial measures should immediately be taken.

The overall quality group, into which water is classified, is determined by the determinant that complies the least with the guidelines for the quality of drinking water.



**TABLE 1: DETERMINANTS WITH AESTHETIC / PHYSICAL IMPLICATIONS**

DETERMINANTS	UNITS*	LIMITS FOR GROUPS			
		A	B	C	D**
Colour	mg/l Pt***	20			
Conductivity	mS/m !at 25 °C	150	300	400	400
Total hardness	mg/l CaCO <sub>3</sub>	300	650	1300	1300
Turbidity	N.T.U****	1	5	10	10
Chloride	mg/l Cl	250	600	1200	1200
Chlorine (free)	mg/l Cl	0,1- 5,0	0,1 – 5,0	0,1 – 5,0	5,0
Fluoride	mg/l F	1,5	2,0	3,0	3,0
Sulphate	mg/l SO <sub>4</sub>	200	600	1200	1200
Copper	µg/l Cu	500	1000	2000	2000
Nitrate	mg/l N	10	20	40	40
Hydrogen Sulphide	µg/l H <sub>2</sub> S	100	300	600	600
Iron	µg/l Fe	100	1000	2000	2000
Manganese	µg/l Mn	50	1000	2000	2000
Zink	mg/l Zn	1	5	10	10
pH****	pH-unit	6,0 – 9,0	5,5 – 9,5	4,0 – 11,0	4,0 – 11,0

\* In this and all following tables "l" (lower case L in ARIAL) is used to denote dm<sup>3</sup> or litre

\*\* All values greater than the figure indicated.

\*\*\* Pt = Platinum Units

\*\*\*\* Nephelometric Turbidity Units

\*\*\*\*\* The pH limits of each group exclude the limits of the previous group

**TABLE 2: INORGANIC DETERMINANTS**

DETERMINANTS	UNITS	LIMITS FOR GROUPS			
		A	B	C	D*
Aluminium	µg/l Al	150	500	1000	1000
Ammonia	mg/l N	1	2	4	4
Antimonia	µg/l Sb	50	100	200	200
Arsenic	µg/l As	100	300	600	600
Barium	µg/l Ba	500	1000	2000	2000
Beryllium	µg/l Be	2	5	10	10
Bismuth	µg/l Bi	250	500	1000	1000
Boron	µg/l B	500	2000	4000	4000
Bromine	µg/l Br	1000	3000	6000	6000
Cadmium	µg/l Cd	10	20	40	40
Calcium	mg/l Ca	150	200	400	400
Calcium	mg/l CaCO <sub>3</sub>	375	500	1000	1000
Cerium	µg/l Ce	1000	2000	4000	4000
Chromium	µg/l Cr	100	200	400	400
Cobalt	µg/l Co	250	500	1000	1000
Cyanide (free)	µg/l CN	200	300	600	600
Gold	µg/l Au	2	5	10	10
Iodine	µg/l I	500	1000	2000	2000
Lead	µg/l Pb	50	100	200	200
Lithium	µg/l Li	2500	5000	10000	10000
Magnesium	mg/l Mg	70	100	200	200
Magnesium	mg/l CaCO <sub>3</sub>	290	420	840	840
Mercury	µg/l Hg	5	10	20	20
Molybdenum	µg/l Mo	50	100	200	200
Nickel	µg/l Ni	250	500	1000	1000
Phosphate	mg/l P	1	See note below	See note below	See note below
Potassium	mg/l K	200	400	800	800
Selenium	µg/l Se	20	50	100	100
Silver	µg/l Ag	20	50	100	100
Sodium	mg/l Na	100	400	800	800
Tellurium	µg/l Te	2	5	10	10
Thallium	µg/l Tl	5	10	20	20
Tin	µg/l Sn	100	200	400	400
Titanium	µg/l Ti	100	500	1000	1000
Tungsten	µg/l W	100	500	1000	1000
Uranium	µg/l U	1000	4000	8000	8000
Vanadium	µg/l V	250	500	1000	1000

\* All values greater than the figure indicated.

**Note FOR Table 2 on phosphate:** Phosphates are not toxic and essential for all life-forms. Natural water will, however, seldom contain phosphate; it is generally seen as an indicator of pollution and is usually accompanied by other pollutants. Wherever drinking water is combined with or consists wholly of reclaimed or recycled water, it may be expected to contain phosphate. The general guideline for a concentration level to be aimed at is 1 mg/l as P. But in many cases this may be difficult to achieve technically. For this reason the Department will allow a phosphate concentration level of up to 5 mg/l as P in water intended for human consumption. Please refer also to the “Note on Phosphate” under Section 3: General Standards for Waste/Effluent.

## 2.2 BACTERIOLOGICAL DETERMINANTS

The bacteriological quality of drinking water is also divided into four groups, namely:

- Group A: Water which is bacteriological very safe;
- Group B: Water which is bacteriological still suitable for human consumption;
- Group C: Water which is bacteriological risk for human consumption, which requires immediate action for rectification;
- Group D: Water, which is bacteriological unsuitable for human consumption.

**TABLE 3: BACTERIOLOGICAL DETERMINANTS**

DETERMINANTS	LIMITS FOR GROUPS			
	A**	B**	C	D*
Standard plate counts per 1 ml	100	1000	10000	10000
Total coliform counts per 100 ml	0	10	100	100
Faecal coliform counts per 100 ml	0	5	50	50
<i>E. coli</i> counts per 100 ml	0	0	10	10

\* All values greater than the figure indicated.

\*\* In 95% of the samples.

NB If the guidelines in group A are exceeded, a follow-up sample should be analysed as soon as possible.

## 2.3 FREQUENCY FOR BACTERIOLOGICAL ANALYSIS OF DRINKING-WATER SUPPLIES

The recommended frequency for bacteriological analysis of drinking water is given in Table 4.

**TABLE 4: FREQUENCY FOR BACTERIOLOGICAL ANALYSIS**

POPULATION SERVED	MINIMUM FREQUENCY OF SAMPLING
More than 100 000	Twice a week
50 000 – 100 000	Once a week
10 000 – 50 000	Once a month
Minimum analysis	Once every three months

### 3 GENERAL STANDARDS FOR WASTE / EFFLUENT WATER DISCHARGE INTO THE ENVIRONMENT

All applications in terms of Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with the General Standard as laid out in Government Gazette Regulation R553 of 5 April 1962.

**TABLE 5 GENERAL STANDARDS FOR ARTICLE 21 PERMITS (EFFLUENTS)**

DETERMINANTS	MAXIMUM ALLOWABLE LEVELS
Arsenic	0,5 mg/l as As
Biological Oxygen Demand (BOD)	no value given
Boron	1,0 mg/l as B
Chemical Oxygen Demand (COD)	75 mg / l as O
Chlorine, residual	0,1 mg/l as Cl <sub>2</sub>
Chromium, hexavalent	50 µg/l as Cr(VI)
Chromium, total	500 µg/l as Cr
Copper	1,0 mg/l as Cu
Cyanide	500 µg/l as CN
Oxygen, Dissolved (DO)	at least 75% saturation**
Detergents, Surfactants, Tensides	0,5 mg/l as MBAS – See also Note 2
Fats, Oil & Grease (FOG)	2,5 mg/l (!gravimetric method)
Fluoride	1,0 mg/l as F
Free & Saline Ammonia	10 mg/l as N
Lead	1,0 mg/l as Pb
Oxygen, Absorbed (OA)	10 mg / l as O*
pH	5,5 – 9,5
Phenolic Compounds	100 µg/l as phenol
Phosphate	1,0 mg/l as P - See also Note 1
Sodium	not more than 90 mg/l Na more than influent
Sulphide	1,0 mg/l as S
Temperature	35°C
Total Dissolved Solids (TDS)	not more than 500 mg / l more than influent
Total Suspended Solids (TSS)	25 mg/l
Typical faecal Coli.	no typical coli should be counted per 100 ml
Zinc	5,0 mg/l as Zn

\* Also known as *Permanganate Value* (or *PV*).

\*\* In Windhoek the saturation level is at approx. 9 mg/l O<sub>2</sub>.

**Note (1) on phosphate:** Phosphates are not toxic and essential for all life forms. Natural water will seldom contain phosphate; it is generally seen as an indicator of pollution and is usually accompanied by other pollutants. Wherever drinking water is combined with or consists wholly of reclaimed or recycled water, it may be expected to contain phosphate. There is no general guideline for phosphate contained in the Regulation 553. But generally it is assumed that eutrophication or algal bloom in dams is promoted by nutrient concentrations as low as 0,01 mg/l as P; generally a phosphate concentration limit for dams of 0,1 mg/l is recommended. All water that is consumed and subsequently discharged, will eventually end up in rivers, dams or

groundwater – that is why for potable water, a concentration level of 1 mg/l as P is aimed at.

But, again, in many cases of waste and effluent treatment, this may be difficult to achieve technically, or the required waste and effluent treatment infrastructure is not available; as the required infrastructure is sophisticated and expensive. The current situation calls for a compromise and for this reason, this Department will judge each application individually on its merits and allow, in certain cases, a phosphate concentration level of up to 15 mg/l as P in any effluent or waste stream to be discharged into the environment. This regulation is subject to be reviewed every two years, calculated from the date of approval of this document.

**Note (2) on detergents, surfactants and ten sides:** The MBAS (or methylene blue active substances) – test does not encompass all surface active compounds currently, commercially available. The limit given is therefore only a guideline. Many of the cleaning agents are toxic to biological life-forms in rivers and dams.

It should be taken into consideration that some commercial products interfere with the effective removal of oil, fat and grease by grease and fat traps, by breaking up such long-chain molecules into shorter ones. These cleaning agents thus effectively allow such components to pass through the traps and land into sections of a treatment plant further down the line and interfere with the process there.

Many cleaning agents contain very powerful disinfectants, and/or biocides. Such substances may interact with biological treatment processes. They may reduce the effectiveness of such treatment or 'kill' it completely, if they land in septic tanks, biofilters or even activate-sludge plants. Their activity may be attenuated by dilution.

#### **4. AUTHORIZATION**

Herewith, the Guidelines for the Evaluation of Drinking Water for Human Consumption with regard to Chemical, Physical and Bacteriological Quality, as well as the General Standards for Article 21\* Permits, amended for detergents, surfactants, ten sides, as well as phosphates, are confirmed and remain in force until further notice.

Issued under my hand with the authority vested in my office, within the Ministry for Agriculture, Water and Rural Development,

**PERMANENT SECRETARY**  
**Dr V Shivute**

**WINDHOEK,**

**DATE STAMP**