

# ENVIRONMENTAL MANAGEMENT PLAN

Proposed Construction and Operation of a Seawater Desalination Plant and its Associated Infrastructure on Portion 7 of Farm 58, Walvis Bay, Erongo Region to Support the Production of Green Hydrogen and Green Ammonia



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## **ACRONYMS**

<b>ABF</b>	Angola Benguela Current
<b>AIDS</b>	Acquired Immuno Deficiency Syndrome
<b>BCLME</b>	Benguela Large Marine Ecosystem
<b>DEA</b>	Department of Environmental Affairs
<b>DO</b>	Dissolved Oxygen
<b>EA</b>	Environmental Assessment
<b>EAP</b>	Environmental Assessment Practitioner
<b>EC</b>	Environmental Commissioner
<b>ECC</b>	Environmental Clearance Certificate
<b>ECC</b>	Environmental Clearance Certificate
<b>EDP</b>	Erongo Desalination Plant
<b>EIA</b>	Environmental Impact Assessment
<b>EMA</b>	Environmental Management Act (Act No. 7 of 2007)
<b>EMP</b>	Environmental Management Plan
<b>H<sub>2</sub>S</b>	Hydrogen Sulphide
<b>HAB</b>	Harmful Algal Bloom
<b>HIV</b>	Human Immune Virus
<b>I&amp;AP</b>	Interested and Affected Parties
<b>LOWs</b>	Low Oxygen Waters
<b>MAWLR</b>	Ministry of Agriculture Water and Land Reform
<b>MEFT</b>	Ministry of Environment, Forestry and Tourism
<b>MFMR</b>	Ministry of Fisheries and Marine Resource

<b>MPA</b>	Marine Protected Area
<b>MSP</b>	Marine Spatial Planning
<b>RDC</b>	Red-Dune Consulting
<b>RO</b>	Reverse Osmosis
<b>ToRs</b>	Terms of References
<b>WB</b>	Walvis Bay

# 1 OVERVIEW

This Environmental Management Plan (EMP) is developed based on the Environmental Impact Assessment (EIA) for the proposed development of the seawater desalination plant and its associated infrastructure, in the Erongo Region. A comprehensive project description and impact assessment are contained in the EIA report.

## 2 PURPOSE OF THE EMP

This Environmental Management Plan (EMP) is a risk strategy that contains logical framework, monitoring programme, mitigation measures, and management control strategies to minimize environmental impacts. It further stipulates the roles and responsibility of persons involved in the project. These strategies are developed to reduce the levels of impacts for the projects.

An EMP is one of the most important outputs of the EIA 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, a decommissioning plan must be developed.

### 3 COMPLIANCE TO THE EMP

This EMP is a legally binding document as given under the provisions of the Environmental Management Act, 2007 (Act No. 7 of 2007). Elof Hansson Hydrogen Namibia (Pty) Ltd and their contractors must adhere to the framework of this document.

### 4 ROLES AND RESPONSIBILITY

The Proponent 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 Proponent's Representative (PR). The Proponent may decide to assign this role to one person for the full duration of the development, or may assign a different PR 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 PR's responsibilities are depicted in Table 1 as follows:

Table 1. PR's responsibilities

<b>Responsibility</b>	<b>Project Phase</b>
Making sure that the necessary approvals and permissions laid out in Table 2 are obtained/adhered to	Throughout the lifecycle of this development
Making sure that the relevant provisions detailed in Section 6.4.1 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>

## **4.1 ENVIRONMENTAL CONTROL OFFICER**

The PR 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 PR/Proponent 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 Proponent 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 Proponent, PR, 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 PR on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the PR 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.

## **4.2 CONTRACTOR**

Contractors appointed by the Proponent 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. Section 6.4.2 applies to contractors appointed during the construction phase. Section 6.4.3 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 6** detail the management measures associated with the roles and responsibilities that have been laid out in this chapter.

### 4.3 ENVIRONMENTAL COMPLIANCE OFFICER

Compliance to EMP is enforced by the environmental inspector as provided for under Environmental Management Act (No. 7 of 2007) (EMA) from the Ministry of Environment Forestry and Tourism. However, other competent authorities such as the Ministry of Fisheries and Marine Resources shall have the right to monitor the project activities in relation to the living marine resources.

This EMP is a legally binding document, non-compliance to the EMP is punishable in accordance to the provision of EMA.

## 5 APPLICABLE LEGISLATION

Legal provisions that have relevance to various aspects of this development are listed in Table 2 below. The legal instrument and applicable corresponding provisions are provided.

Table 2. Legal provisions relevant to this development

Policy/Legislation	Provisions	Applicability to the Project
<b>The Namibian Constitution</b>	The Namibian constitution is the supreme law of the country which is committed to sustainable development. Article 95(1) of the Constitution of Namibia states that: - <i>“The State shall actively promote and maintain the welfare of the people by adopting policies aimed at ... The maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future”</i> .	Undertake an Environmental Assessment to protect the environment and maintain the marine and terrestrial ecological process.



Policy/Legislation	Provisions	Applicability to the Project
<p><b>The Environmental Management Act (No. 7 of 2007)</b></p>	<p>The Environmental Management Act (No. 7. of 2007) aims to promote the sustainable management of the environment and the use of natural resources and to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters. The act provides a list of activities that may not be undertake without an environmental clearance certificate.</p>	<p>The project must abide by the statutory requirement of EMA the EIA regulation. Carry out an EIA and develop an EMP for the project.</p>
<p><b>Draft Pollution Control and Waste Management Bill</b></p>	<p>This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management. The Bill will repeal the Atmospheric Pollution Prevention Ordinance (11 of 1976) when it comes into force. The Bill also provides for noise, dust or odour control that may be considered a nuisance. Further, the Bill advocates for duty of care with respect to waste management affecting humans and the environment and calls for a waste management licence for any activity relating to waste or hazardous waste management.</p>	<p>Management of Waste, and any pollutant such as brine. Chemical that may have effect on humans etc.</p>
<p><b>The Occupational Safety and Health Act No. 11 of 2007;</b></p>	<p><b>Safety:</b> A safety risk is a statistical concept representing the potential of an accident occurring, owing to unsafe operation and/or environment. In the working context “SAFETY” is regarded as “free from danger” to the health injury and to properties.</p>	<p>During construction, accidents are bound to happen if the working environmental is not safe and healthy.</p>

Policy/Legislation	Provisions	Applicability to the Project
	<p><b>Health:</b></p> <p>Occupational Health is aimed at the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations. This is done by ensuring that all work-related hazards are prevented and where they occur, managed.</p>	<p>The project should maintain good and healthy standards, at the work place, cleanliness, adequate sanitary facilities, protection against dangerous substances.</p>
<p><b>Public Health Act No. 36 of 1919</b></p>	<p>The Act serves to protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.</p>	<p>The construction of brine outlet pipelines would cut across public place and into the sea. The proponent should ensure that the site is off limits from public during construction to avoid fatalities.</p>
<p><b>Water Resources Management Act 11, (2013)</b></p>	<p>This Act provides a framework for managing water resources based on the principles of integrated water resources management. It provides for the management, development, protection, conservation, and use of water resources. Furthermore, any watercourse on/or in close proximity to the site and associated ecosystems should be protected in alignment with the listed principles.</p>	<p>Water abstraction and brine outlet directly affect the sea ecosystem</p>
<p><b>Petroleum Product and Energy Act No, 13 of 1990</b></p>	<p>This Act provides a framework for handling and distribution of petroleum products which may include purchase, sale, supply, acquisition, possession, disposal, storage or transportation thereof.</p>	<p>During construction, there would be handling of fuel and hydrocarbons for heavy vehicles. Hence the act compels the proponent to handle hydrocarbons safely.</p>
<p><b>Labour Act No. 6 of 1992</b></p>	<p>This Act aims to regulate labour in general and includes the protection of</p>	<p>Ensure that labour laws are followed.</p>

Policy/Legislation	Provisions	Applicability to the Project
	the health, safety and welfare of employees. The 1997 Regulations relating to the Health and Safety of employees at work sets out the duties of the employer, welfare and facilities at the workplace, safety of machinery, hazardous substances, physical hazards, medical provisions, construction safety and electrical safety.	
<b>Regional Council Act, 1992 (Act No. 22 of 1992)</b>	The Regional Councils Act legislates the establishment of Regional Councils that are responsible for the planning and coordination of regional policies and development. The main objective of this Act is to initiate, supervise, manage and evaluate development at regional level.	The area is in the jurisdiction of the Erongo Regional Council and Walvis Bay Municipality. All relevant laws must be adhered to.
<b>Soil Conservation Act No. 76 of 1969</b>	This act promotes the conservation of soil, prevention of soil erosion.	Improper planning of construction can cause soil degradation and erosion through earth work.
<b>National Heritage Act No. 27 of 2004</b>	The Act makes provision for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. Part V Section 46 of the Act prohibits removal, damage, alteration or excavation of heritage sites or remains, while Section 48 sets out the procedure for application and granting of permits such as	Clearing and excavation may unearth archaeological material.
<b>International Best Practises</b>	<b><i>Precautionary Approach Principle</i></b> This principle is worldwide accepted when there is a lack of sufficient knowledge and information about the possible threats to the environment.	Although not envisioned, the proponent is urged to apply great precaution in an event of uncertainty.

Policy/Legislation	Provisions	Applicability to the Project
	<p><b><i>Polluter Pays Principle</i></b></p> <p>This principle ensures that proponents take responsibility for their actions. Hence, in cases of pollution, the proponent bears the full responsibility to clean up the environment.</p>	<p>In the event of pollution, the proponent shall incur the clean-up cost.</p>

## 6 IMPACT ASSESSMENT

A set of mitigation measures were developed during the EIA study to mitigate the potential impacts to low level. This sections in this chapter shows the identified impact and a set of mitigation measures required to reduce the potential impacts to low levels. Please note the following;

- The provision of EMA empowers the Environmental Inspector to undertake environmental monitoring at projects that are issued with Environmental Clearance Certificates (ECCs). Consequently, the monitoring indicators will ensure adherence of the proponent to the set of mitigation measures.
- In this ESMP, monitoring indicators refer to what should be in place to indicate what actions are undertaken to implement project activities.

### 6.1 Construction Phase

#### *Summary of Impacts during construction phase*

- Unfair labour practises and lack of skill transfer
- Loss of natural scenic and aesthetic value
- Habitat destruction and loss of biodiversity
- General littering and solid waste pollution
- Pollution of the environment with hazardous waste
- Injuries and health risks to employees during working hours
- Noise pollution and vibration could be nuisance to the nearby land owners / residence
- Dust pollution to nearby land owners / residents and exposure of employees to excess dust could be harmful to their health.

- Heritage and archaeology.
- Restricted access to anglers at angling site during construction.
- Land degradation by movement of heavy vehicles on the beach as well from digging and trenching during construction and installation of inlet and outlet pipelines (inlet sump).
- Habitat destruction and loss of inter-tidal habitat by construction of inlet sump.
- Increased suspension of sediments, increase turbidity and pollutants in the water could cause;
  - Reduced sunlight penetration,
  - Decreased dissolved oxygen levels,
  - Impaired feeding and reproduction and disruption of spawning, and
  - Larval development

## **6.2 Operation Phase**

### ***Summary of Impacts during operational phase:***

- Unfair labour practises and lack of skill transfer
- General littering and solid waste pollution
- Pollution of the environment with hazardous waste
- Injuries and health risks to employees during working hours
- Alteration of water quality and consequently impact on marine ecology, local extinction, species migration from effluent / brine discharge
- Destruction of living marine resource and ecological disturbances from biocides and other chemicals.

## **6.3 Decommissioning Phase**

In general, the impacts associated with this phase will be similar to that of the construction phase.

## 6.4 Management Actions

### 6.4.1 Planning and Design Phase

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
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>
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, large trees, etc.</li> <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 plant species such 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>• It is recommended that alternative and renewable source of energy be explored and introduced into the proposed development to reduce dependency on the grid.</li> <li>• Solar geysers and panels should be introduced to provide for general lighting and heating of water and buildings.</li> <li>• Other ‘green’ technologies to reduce the proposed development’s dependency on fossil fuel should be explored where possible.</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 necessities.</li> <li>• Water saving mechanisms should be incorporated within the proposed development’s design and plans in order to further reduce water demand.</li> <li>• Re-use of treated waste water should be considered wherever possible to reduce the consumption of potable water.</li> <li>• Adhere to water quality guidelines in terms of the Water Resources Management Act 11, 2013.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>• Ensure that road junctions have good sightlines.</li> </ul>

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <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>

### 6.4.2 Construction Phase

Note that all tables and figures in this sections 6.4.2 and 6.4.3 refers to Annexure H (Fauna and Flora Biodiversity Report)

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
Employment / Socio-Economic advancement of local	Possible exclusion of local communities from job opportunities. Lack of legal employment contracts, Unfair compensation of workers.	<ol style="list-style-type: none"> <li>1. Ensure that all general work is reserved for local people unless in circumstances where specialized skills are required.</li> <li>2. Fair compensation and labour practice as per Namibian Labour Laws must be followed.</li> <li>3. Abide by the labour act</li> <li>4. Provide contract to employees.</li> <li>5. Support local training to develop capacity.</li> </ol>	To ensure that local people are not excluded from project activities and benefits.	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- Labour inspector</li> </ul>	Employment records On-site inspection and interviews with employees	<ol style="list-style-type: none"> <li>1. Employment contract</li> <li>2. Training and capacity building programs</li> <li>3. Workshop and Training attendance registers</li> <li>4. Employees certificate of attendance</li> </ol>

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
Skill and Knowledge transfer	Lack of capacity in the community to maintain project infrastructure, operate project intervention	<ol style="list-style-type: none"> <li>1. Identify and train competent people (Preferable youth) to undertake project activities and initiatives.</li> <li>2. Ensure skill transfer to the locals.</li> <li>3. Undertake Training Needs Assessment (TNA).</li> </ol>	To build local capacity	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- Labour inspector</li> </ul>	Undertake training and capacity needs assessment Provide training to employees	<ol style="list-style-type: none"> <li>1. Number of training undertaken</li> <li>2. Attendance registers and training reports, certificate of attendance</li> </ol>
Construction and installation of pipelines	Loss of natural scenic and aesthetic value	<ol style="list-style-type: none"> <li>1. Ensure good housekeeping.</li> <li>2. Piles of excavated sand must be well stored.</li> <li>3. Rehabilitate the excavated area back to its natural state.</li> <li>4. Do not bury waste on site</li> <li>5. Cordon off construction equipment to avoid being seen.</li> </ol>	To ensure trenches, vehicles tracks, and all construction prints are rehabilitated to restore the area scenic beauty.	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	Undertake physical inspection of construction area and observe public complains	<ol style="list-style-type: none"> <li>1. Solid waste generation and management</li> <li>2. Rehabilitation of excavated areas</li> </ol>
Fauna	Faunal disturbance will vary depending on the scale/intensity of	<ol style="list-style-type: none"> <li>1. Limit the development to actual sites to be developed and avoid affecting adjacent areas, especially</li> </ol>	To ensure protection and conservation of fauna throughout the project cycle.		<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> </ul>	Undertake physical inspection of construction area	Construction Phase <ol style="list-style-type: none"> <li>1. Sensitive areas avoided;</li> <li>2. Illegal capture/use/collection of vertebrate fauna &amp; flora;</li> </ol>



ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
	the development operation and associated and inevitable infrastructure.	well vegetated Swakop/Tumas ephemeral drainage lines; rocky outcrops (especially white geology areas), throughout the entire area.  2. Avoid development & associated infrastructure in sensitive areas – e.g., well vegetated ephemeral drainage lines; rocky outcrops (especially white geology areas); small drainage lines with Welwitschia mirabilis plants; lapped-faced vulture nesting sites; rocky outcrops; brown hyena latrines, etc. – in the proposed development area (See Sections 4 & 5; Tables 10 & 12). This would minimise the negative effect on the local			- Contractor	and observe loss of habitat, public complains	<ol style="list-style-type: none"> <li>3. Rehabilitation of affected areas – e.g., tracks, etc.;</li> <li>4. No new sites disturbed; and</li> <li>5. Effectiveness of control measures.</li> </ol> Operational Phase <ol style="list-style-type: none"> <li>1. Erosion control;</li> <li>2. Illegal capture/use/collection of vertebrate fauna; and</li> <li>3. Vertebrate fauna mortalities.</li> </ol> Decommissioning Phase <ol style="list-style-type: none"> <li>1. All tracks/roads rehabilitated;</li> <li>2. All development sites rehabilitated;</li> <li>3. Erosion control;</li> <li>4. Illegal capture/use/collection of vertebrate fauna; and</li> </ol> Vertebrate fauna mortalities.

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>environment especially unique features serving as habitat to various vertebrate fauna species.</p> <p>3. Remove (e.g., capture) unique and sensitive fauna, especially sedentary and slow-moving reptiles (e.g., Namaqua chameleon, etc.) before commencing with the development activities and/or species serendipitously located during this period and relocate to a less sensitive/disturbed sites in the immediate area.</p> <p>4. Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods, indiscriminate killing of perceived dangerous species (e.g., snakes, etc.)</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>and collecting of wood (e.g., Swakop River area) as this would diminish and negatively affect the local fauna – especially during the development phase(s).</p> <p>5. Attempt to avoid the destruction of bigger trees during the development phase(s) – especially with the development of access &amp; pipeline routes – as these serve as habitat for a myriad of fauna.</p> <p>6. Rehabilitation of the disturbed areas – i.e., initial development access route “scars” and associated tracks as well as associated development infrastructures. Preferably workers should be transported in/out to the construction sites daily to</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>avoid excess damage to the local environment (e.g., pollution, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company's environmental integrity, but also show true local commitment to the environment.</p> <p>7. Prevent domestic pets – e.g., cats &amp; dogs – accompanying the workers during the construction phase as cats decimate the local fauna and interbreed &amp; transmit diseases to the indigenous African wild cat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna. The indiscriminate and</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>wanton killing of the local fauna by such pets should be avoided at all costs.</p> <p>8. Initiate a suitable waste removal system (i.e., remove to Swakopmund/Walvis Bay and not store on site) as this often attracts wildlife – e.g., baboons, black-backed jackal, crows, gulls, etc. – which may result in human-wildlife conflict issues.</p> <p>9. Educate/inform contractors and staff on protected species (See Tables 1- 16) to avoid and the consequences of illegal collection of such species.</p> <p>10. Investigate the idea of employing an Environmental Officer during the construction</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>phase(s) to ensure compliance and minimise the overall impact on the fauna and the environment.</p> <p><b>Tracks</b></p> <p><b>New proposed main access route(s)</b></p> <p>1. These track(s) should avoid the lapped-faced vulture nesting tree sites (See Table 12; Figures 14-15). Also avoid other sensitive areas – e.g., Salsola dune hummocks, along drainage lines, rocky outcrops, etc. (See Section 5). This would minimise the effect on localised potentially sensitive habitats in the area.</p> <p><b>All tracks</b></p> <p>1. Avoid driving randomly through the area (i.e., enforce “track discipline”),</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>but rather stick to permanently placed roads/tracks – especially during the construction phase. This would minimise the effect on localised potentially sensitive habitats in the area.</p> <p>2. Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit. Lower speeds would also minimise dust pollution.</p> <p>3. Implement erosion control. – i.e., avoid constructing tracks up steep gradients; incorporate erosion furrows (runoff sites) and humps along tracks to</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>channel water off the tracks to minimise erosion problems; cross drainage lines at right angles, etc. The area(s) towards &amp; adjacent the drainage line(s) are easily eroded, and further development may exacerbate this problem. Avoid construction within 50m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated flora and fauna.</p> <p>4. Avoid disturbance of Salsola dune hummock area to the east of the saline pan).</p> <p><b>Farm 58 Developments</b></p> <p>1. Avoid disturbance of rocky ridges &amp; small vegetated ephemeral drainage lines</p>					



ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>on northern/northeastern boundary.</p> <p><b>Pipeline Developments</b></p> <ol style="list-style-type: none"> <li>1. Bury the pipeline or else it could become a barrier to most domestic stock, wild ungulates (e.g., Hartmann's mountain zebra, oryx, springbok) and ostrich.</li> <li>2. Do not leave the pipeline trench open overnight and/or have escape routes at either end to allow for trapped fauna to escape.</li> <li>3. The recommended alternative route (dotted white line) – See Figure 38 – would have the least impact on biodiversity and avoid pristine areas, but rather follow existing tracks along existing development corridors.</li> </ol>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>4. Implement erosion control measures along the pipeline maintenance track – e.g., erosion bumps, cross drains, etc.</p> <p><b>Farm Geluk Developments</b></p> <p>1. Avoid disturbances on the rocky ridges with patches of Aloidendron (Aloe dichotoma) dichotomum and A. asperifolia and small vegetated ephemeral drainage lines in the northern/northeastern parts of the proposed development area (See Figure 39).</p> <p>2. Avoid using chemicals to keep the water storage infrastructure areas clear of vegetation but rather use indigenous sheep (e.g., Damara sheep) to keep the vegetation short.</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p><b>Vulture nests</b></p> <p>1. Avoid the lapped-faced vulture nesting tree sites (See Table 12; Figures 14-15). These vultures are listed as endangered by the IUCN (2023) with an estimated world population of only 5,700 birds and a decreasing population trend. Disturbances could result in nests being abandoned further adding to the demise of this species.</p> <p><b>Hyena latrines</b></p> <p>1. Brown hyena latrines are important for social and territorial purposes and should be avoided (See Table 10; Figure 12).</p>					
Flora	Destruction of plants and their habitat	<p><b>General</b></p> <p>1. Avoid well vegetated Swakop/Tumas ephemeral drainage lines; rocky</p>	To ensure protection and conservation of flora throughout the		- Proponent's Representative (PR)	Undertake physical inspection of	Construction Phase 1. Sensitive areas avoided;

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>outcrops (especially white geology areas), throughout the entire area.</p> <p>2. Identify protected and unique species (i.e., Aloe spp., Commiphora saxicola (rock corkwood), Hoodia gordonii, Lithop spp., Welwitschia mirabilis (welwitschia), etc.). Other important species are the larger Acacia erioloba (camel thorn) specimens used by the endangered lappet-faced vultures as nesting sites before the commencement of development activities in areas where these occur and avoid.</p> <p>3. Prevent and discourage the collecting of firewood (e.g., Swakop River) as dead wood has an</p>	project cycle.		<p>- ECO</p> <p>- Contractor</p>	<p>construction area and observe loss of habitat, public complains</p>	<p>2. Illegal capture/use/collection of flora;</p> <p>3. Rehabilitation of affected areas – e.g., tracks, etc.;</p> <p>4. No new sites disturbed; and</p> <p>5. Effectiveness of control measures.</p> <p>Operational Phase</p> <p>1. Erosion control;</p> <p>2. Illegal capture/use/collection of flora; and</p> <p>Decommissioning Phase</p> <p>1. All tracks/roads rehabilitated;</p> <p>2. All development sites rehabilitated;</p> <p>3. Erosion control;</p> <p>4. Illegal capture/use/collection of flora.</p>

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>important ecological role. Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g., chopping down of live and/or protected tree species such as <i>Acacia erioloba</i>, etc. which is a good quality wood.</p> <p>4. Avoid the removal and damage of bigger trees (especially protected species (i.e., <i>Acacia erioloba</i> (camel thorn), <i>Faidherbia albida</i> (ana tree), etc. – during developments – including the development of access routes – as these serve as habitat for a myriad of fauna.</p> <p>5. Implement a policy of “no tolerance” towards the</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>existing invasive alien plant species (e.g., <i>Nicotiana glauca</i>, <i>Prosopis</i> spp. – heavy infestations observed in the Swakop River area) in the general area. This should include the removal and destruction of these species throughout the proposed development areas. Such activity would be beneficial to the overall ecology of the area, especially the Swakop River area where most of these aliens currently occur.</p> <p>6. Rehabilitation of the disturbed areas – i.e., initial development access route “scars” and associated tracks, as well as temporary accommodation</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>sites. Preferably workers should be transported in/out to the construction sites daily to avoid excess damage to the local environment (e.g., wood collection, poaching, etc.). Such rehabilitation would not only confirm the various development companies' environmental integrity, but also show true local commitment to the environment.</p> <p>7. Limit development – i.e., keep to the bare minimum – in the drainage lines or within 50m of these drainage lines to preserve the associated riparian flora (and associated fauna).</p> <p>8. Educate/inform contractors on protected</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>species to avoid and the consequences of damaging such species. Liaise with MEFT to provide this service.</p> <p>9. Investigate the idea of employing a qualified environmental officer (EO) during the construction phase to ensure appropriate conduct by contractor(s).</p> <p>10. Avoid the use of herbicides for plant/weed control throughout the areas.</p> <p>11. Employ an ecologist for advice on the best route(s)/sites, etc. prior to</p> <p>12. construction – i.e., assist with the final alignment.</p> <p><b>Tracks</b></p> <p><b>New proposed main access route(s)</b></p> <p>13. These track(s) should avoid the <i>Acacia erioloba</i></p>					



ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>(camelthorn) with lapped-faced vulture nest sites (See Table 12; Figures 14- Also avoid other sensitive areas – e.g., Salsola dune hummocks, along drainage lines, rocky outcrops, etc. (See Section 5). This would minimise the effect on localised potentially sensitive habitats in the area.</p> <p><b>All tracks</b></p> <p>14. Avoid driving randomly through the area (i.e., enforce “track discipline”), but rather stick to permanently placed roads/tracks – especially during the construction phase. This would minimise the effect on localised potentially sensitive flora/habitats in</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>the area.</p> <p>15. Stick to speed limits of maximum 30km/h as this would result in less dust pollution potentially affecting flora. Speed humps could also be used to ensure the speed limit.</p> <p>16. Implement erosion control. – i.e., avoid constructing tracks up steep gradients; incorporate erosion furrows (runoff sites) and humps along tracks to channel water off the tracks to minimise erosion problems; cross drainage lines at right angles, etc. The area(s) towards &amp; adjacent the drainage line(s) are easily eroded, and further development may exacerbate this problem. Avoid</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>construction within 50m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated flora and fauna.</p> <p><b>Farm 58 Developments</b></p> <p>17. Avoid disturbance of rocky ridges &amp; small vegetated ephemeral drainage lines on northern/northeastern boundary.</p> <p><b>Pipeline Developments</b></p> <p>18. Use the excavated soil to fill the trench when burying the pipeline and not disturb other areas.</p> <p>19. Eradicate all invasive alien plants expected to benefit from leaks during maintenance activities once the pipeline is operational.</p> <p>20. The recommended</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>alternative route (dotted white line) – See Figure 38 – would have the least impact on biodiversity and avoid pristine areas, but rather follow existing tracks along existing development corridors.</p> <p>21. Implement erosion control measures along the pipeline maintenance track – e.g., erosion bumps, cross drains, etc.</p> <p><b>Farm Geluk Developments</b></p> <p>22. Avoid disturbances on the rocky ridges with patches of <i>Alويدندرون</i> (<i>Aloe dichotoma</i>) <i>dichotomum</i> and <i>A. asperifolia</i> and small vegetated ephemeral drainage lines in the northern/northeastern parts of the proposed development area (See</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>Figure 39).</p> <p>23. Avoid using chemicals to keep the water storage infrastructure area clear of vegetation but rather use indigenous sheep (e.g., Damara sheep) to keep the vegetation short.</p> <p><b>Vulture nests</b></p> <p>24. Avoid the Acacia erioloba (camelthorn) trees with lapped-faced vulture nest sites (See Table 12; Figures 14-15). These vultures are listed as endangered by the IUCN (2023) with an estimated world population of only 5,700 birds and a decreasing population trend. Disturbances could result in nests being abandoned further adding to the demise of this</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		species.					
General Waste and pollution control	Project activities such as construction will produce construction wastes such as building rubbles, used oil cans drums, metals, and household solid and liquid waste.	<ol style="list-style-type: none"> <li>Maintain good housekeeping on all project sites.</li> <li>Designate a storage area for building rubbles.</li> <li>Provide skip bins for construction waste.</li> <li>Provide labelled household waste drums for household solid waste.</li> <li>Ensure separate ablution facilities for men and women.</li> </ol>	To prevent littering and to ensure good and tidy house keeping	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	Undertake physical inspection of construction area and observe public complains	<ol style="list-style-type: none"> <li>Solid waste generation and management program</li> <li>Labelled waste drums and skip bins</li> <li>Gender segregated ablution facilities</li> </ol>
Hazardous waste	Pollution of the environment with hazardous waste	<ol style="list-style-type: none"> <li>Vehicles must be well serviced and maintained to avoid oil spills and excessive emissions.</li> <li>All hydrocarbons must be stored in an enclosed environment.</li> <li>Fuelling of site bound equipment such as excavators must be done</li> </ol>	To prevent pollution from hazardous waste	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	Develop a hazardous waste management plan Physical observation of contaminated areas	<ol style="list-style-type: none"> <li>Service record of vehicles</li> <li>Storage area for hydrocarbons</li> <li>Bunded fuel sites</li> <li>Drip trays</li> <li>Designated drums for hazardous waste</li> </ol>

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>on banded structure.</p> <p>4. Parked construction vehicles and machines must be provided with drip trays.</p> <p>5. Used oil, grease and lubricant cans must be collected in appropriate drums and disposed of at an approved waste disposal site.</p>					
Health and Safety for employees	<p>Job opportunities leads to new social relationship which often spread disease, particularly pandemic such as HIV and AIDS and substance abuse.</p> <p>Hiring off unlicensed employees to operate vehicles and special</p>	<p>1. Provide awareness to the employees on dangers of HIV/AIDS, alcohol and drug abuse.</p> <p>2. Ensure the provision of condoms at project sites.</p> <p>3. Develop a healthy and safety plan / policy.</p> <p>4. All employees must go through a health and safety induction.</p> <p>5. All employees working offshore must acquire a</p>	To ensure employee and public safety	Low	<p>- Proponent's Representative (PR)</p> <p>- ECO</p> <p>- Contractor</p> <p>- Random check by designated law environmental / health inspector</p>	<p>Site inspection checklist through physical observation, Random interviews with employees</p>	<p>1. Poof of HIV-AIDS and substance abuse awareness raising</p> <p>2. Condoms on sites</p> <p>3. Health and safety plans</p> <p>4. Induction attendance registers</p> <p>5. Valid driver's licences for designated drivers</p> <p>6. Rotating flushing lights on heavy and construction vehicles</p>

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
	<p>machinery pose safety risk to themselves, co-workers and public. Additionally, employees are subject to dust and noise pollution as well as other occupational health and safety risks.</p>	<p>health certificate.</p> <ol style="list-style-type: none"> <li>6. Only licensed employees should be allowed to operate specialized vehicle</li> <li>7. All heavy vehicles must have a rotating flashing light installed for visibility.</li> <li>8. Ensure that all vehicle are well serviced and roadworthy.</li> <li>9. All employees must be provided with adequate Personal Protective Equipment (PPE).</li> <li>10. No employee must be allowed to be at work station without adequate PPE.</li> <li>11. There must be a first aid kit with adequate medicine.</li> <li>12. Provide adequate gender sensitive ablution facility.</li> <li>13. Provide clean drinking water.</li> </ol>					<ol style="list-style-type: none"> <li>7. Roadworthy vehicles</li> <li>8. Personal Protective Equipment</li> <li>9. Adequate First Aid Kit</li> <li>10. Emergency health facilities</li> <li>11. Ablution facilities</li> <li>12. Warning sign at designated areas</li> <li>13. First aid training attendance register of supervisors</li> <li>14. Construction area fence</li> </ol>



ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>14. Erect warning signs at designated sites to alert public of potential dangers.</p> <p>15. Trucks carrying sand and aggregate must be covered to avoid material flying off.</p> <p>16. Adhere to the Labour act, non-toxic human dust exposure levels may not exceed 5mg/m<sup>3</sup> for respiratory dust and 15mg/m<sup>3</sup> for total dust.</p> <p>17. Abide by the Occupational Health and Safety and Labour Act of Namibia and other statutory requirement such as International Labour Practise (ILO).</p> <p>18. Supervisors must undergo an occupational health and first aid course.</p> <p>19. Train employees on the possible health hazards to avoid potential risks</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		20. Cordon off the construction areas / sites.					
Noise pollution	Noise pollution is expected from the movement of heavy machineries, digging and excavating of trenches and concrete mixing. This is site specific, hence affecting mostly employees and surrounding communities	<ol style="list-style-type: none"> <li>1. Maintain low speed on project sites.</li> <li>2. All vehicles must be well serviced to prevent excessive noise.</li> <li>3. Do not hoot unnecessary.</li> <li>4. Do not rev the vehicle engines.</li> <li>5. Do not play loud music / radio.</li> <li>6. Switch off engine off vehicles when not in use.</li> <li>7. No employees must be exposed to noise levels above the 85dB (A) limit over a period of 8 hours. Should the noise level be higher than 85dB (A), the employer must implement a hearing conservation program such as noise monitoring.</li> </ol>	To prevent noise pollution to employees and the surrounding communities	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	Physical observation, Install seed traps	<ol style="list-style-type: none"> <li>1. Record of speeding</li> <li>2. Record of vehicle service records</li> <li>3. Complaints of noise from employees and general public</li> </ol>

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		8. Stationary vehicles and machines must be switched off at time.					
Dust pollution	Land clearing, digging and excavation of trenches, movement of vehicles and heavy machinery on project sites, concrete work, transportation of sand to site and concrete stones, cement mixing may create fugitive dust, uncoordinated / reckless driving on gravels roads could cause low visibility to other road users	<ol style="list-style-type: none"> <li>1. Movement of heavy vehicles must strictly be restricted on site.</li> <li>2. Adhere to the minimum speed limit of 30 or 40km/hour.</li> <li>3. Do not excavate and/or offload sand during heavy winds.</li> <li>4. Trucks carrying sand must be covered.</li> <li>5. Sand stock piles must be covered or regularly water sprayed with water.</li> <li>6. On site where soil is loosened by vehicle movement, apply dust a suppression method such as water spraying.</li> <li>7. Cement and concrete must be mixed with concrete</li> </ol>	To prevent air pollution and dust nuisance to nearby land owners / residents and prevent exposure of employees to excess dust that maybe harmful to their health.	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	Physical observation, Install dustfall buckets in the area.	Dust monitoring

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>mixers and not manually in the open.</p> <p>8. Cement bags must be stored and disposed of properly and may not be shaken in the open.</p>					
Disturbance of recreation fishing	Restricted access to anglers at angling site during construction.	<ol style="list-style-type: none"> <li>1. Create awareness of about the proposed project.</li> <li>2. Inform public of areas to be closed and the duration of closure.</li> </ol>	To inform anglers about the proposed closing of the beach area in order to avoid conflicts	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	<p>Site notices, media notices</p> <p>Public meetings</p>	<ol style="list-style-type: none"> <li>1. Area closure poster</li> <li>2. Proof of consultation to raise awareness</li> </ol>
Land degradation and pollution	Land degradation by movement of heavy vehicles on the beach as well from digging and trenching during construction and installation of inlet and outlet pipelines (inlet sump)	<ol style="list-style-type: none"> <li>1. Ensure digging takes place during low tide.</li> <li>2. Excavated areas must be properly backfilled and compacted to prevent erosion.</li> <li>3. Avoid indiscriminate driving on the beach, ensure driving within designated areas.</li> </ol>	To prevent land degradation from heavy vehicles and equipment's'.	Low	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> <li>- ECO</li> <li>- Contractor</li> </ul>	<p>Site inspection checklist through physical observations.</p>	<ol style="list-style-type: none"> <li>1. Rehabilitated trenches and vehicles tracks</li> <li>2. Designated driving areas of construction vehicles.</li> </ol>
Destruction of Intertidal habitat	Habitat destruction and loss of intertidal habitat by	<ol style="list-style-type: none"> <li>1. There are no practical mitigation measure to prevent destruction of</li> </ol>	To minimise destruction of intertidal biota	Medium	<ul style="list-style-type: none"> <li>- Proponent's Representative (PR)</li> </ul>	Design a narrow intertidal servitude	Recolonization of disturbed area

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
	construction of inlet sump	<p>intertidal biota, however the impact is expected to be minimal and short.</p> <p>2. Construction should however follow a narrow path, where both the inlet and outlet pipes will be installed to minimize the impacts.</p>			<p>- ECO</p> <p>- Contractor</p>		
Seabed construction for intake sump, pipelines and discharge points	Disturbance to marine habitats and ecosystems	<p>1. There are not key and practical mitigation measures to reduce the impact of plumes during seabed construction. This impact is however expected to be temporal, localised and consequently with low impact.</p> <p>2. Shorten the construction phase.</p>	To ensure minimal seabed disturbance and minimal plumes from seabed construction	Medium	<p>- Proponent's Representative (PR)</p> <p>- ECO</p> <p>- Contractor</p> <p>- Ministry of Fisheries and Marine Resources (MFMR)</p>	<p>Physical inspection of surface water coloration.</p> <p>Water quality assessment at offshore construction site</p>	Plumes dispersion
Heritage Resources	The NW landscape has a rich ancient history, some of the	1. Employee must be trained on the possible find of heritage and	To ensure protection of artefacts, heritage and archaeological	Low	- Proponents Representative (PR)	Implement buffer zones to between	Reported Heritage Material

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
	works heritage sites are found there. It's possible to stumble on heritage and archaeological materials during digging and excavating that could be destroyed if precaution measure are not taken.	<p>archaeological material in the area.</p> <p>2. Implement a chance find and steps to be taken for heritage and archaeological material finding (Heritage (rock painting and drawings), human remains or artefacts) are unearthed by;</p> <ul style="list-style-type: none"> <li>i. Stopping the activity immediately</li> <li>ii. Informing the operational manager or supervisor</li> <li>iii. Cordoned of the area with a danger tape and manager to take appropriated pictures.</li> </ul> <p>Manager/supervisor must</p>	materials		<ul style="list-style-type: none"> <li>- ECO</li> <li>- Contractor</li> <li>- Heritage Council</li> </ul>	<p>development footprint and heritage/archaeological and historical resources</p>	

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		report the finding to the following competent authorities, National Heritage Council of Namibia (061 244 375) National Museum (+264 61 276800) or the National Forensic Laboratory (+264 61 240461).					

### 6.4.3 Operational Phase

The proponent is required to implement similar mitigation measure to those of construction phase for the following impact;

- Unfair labour practises and lack of skill transfer
- General littering and solid waste pollution
- Pollution of the environment with hazardous waste
- Injuries and health risks to employees during working hours

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
Brine / Effluent Discharge	Alteration of water quality and consequently impact on marine ecology, local extinction, species migration	<ol style="list-style-type: none"> <li>1. Pre-dilute the brine to enhance quick mixing.</li> <li>2. Install diffuser system to enhance mixing.</li> <li>3. Install outfall diffuser system to increase initial dilution and reduce salinity and temperature, or in open discharge, dilution with co-discharge, i.e. cooling water of power plant.</li> <li>4. Use low-toxicity chemicals as far as practicable.</li> </ol>	To ensure local water quality is not deteriorated by the effluent discharge	Medium	<ul style="list-style-type: none"> <li>- PR</li> <li>- ECO</li> <li>- Contractor</li> <li>- MFMR</li> </ul>	Laboratory test of water quality  Install of diffusers on the outlet pipeline	<ol style="list-style-type: none"> <li>1. Salinity</li> <li>2. Dissolved oxygen</li> <li>3. PH</li> <li>4. Temperature</li> </ol>



ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>5. Limit the use of scale-control additives to minimum practicable quantities.</p> <p>6. Avoid antiscalants that increase nutrient levels (e.g. polyphosphate antiscalants).</p> <p>7. Select an antiscalant that has relevant ecotoxicological testing.</p> <p>8. Conduct Whole Effluent Toxicity (WET) testing of the brine effluent; and implement shock dosing of biocide in preference to continual dosing.</p> <p>9. Dechlorinate effluent prior to discharge with sodium metabisulphite (SMBS).</p> <p>10. Undertake ‘pigging’ of intake and discharge pipelines to reduce the need for and costs of</p>					

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>biocides.</p> <p>11. Implement a monitoring program for dissolved oxygen, temperature and salinity at areas surround the discharged pipe.</p>					
Biocides and Co-pollutant	The biocides are meant to kill living marine organisms to prevent biofouling and could consequently lead to disturbance of marine ecology as they are constituent of the effluent / brine	<p>1. Use Sodium Bisulfite to dechlorinate or other environmentally friendly dechlorinating products</p> <p>2. Continuous monitoring of brine effluent.</p>	To prevent disturbance of marine ecology	Medium	<p>- PR</p> <p>- ECO</p> <p>- Contractor</p> <p>- MFMR</p>	<p>Use environmentally friendly dechlorinating products</p> <p>Laboratory test of water quality at the discharge area</p>	<p>1. Water quality</p> <p>2. High level of Biocides and Co-pollutant at the discharge area</p>
Entrainment and Impingement	Killing of living marine resource and ecological disturbances at the inlet pipeline	<p>1. Fit intertwined meshed screen to prevent impingement.</p> <p>2. Avoid installing the inlet pipe at spawning growing</p> <p>3. Install the inlet pipe further offshore, for eggs</p>	To prevent disturbances of spawning activities and injuries of large marine organisms at the inlet pipeline.	Medium	<p>- PR</p> <p>- ECO</p> <p>- Contractor</p> <p>- MFMR</p>	<p>Pressure Pump velocity output at intake</p> <p>Physical Observation</p>	<p>1. Suction velocity and intake</p> <p>2. Record of mortalities of marine organisms by injuries</p> <p>3. Record of large</p>

ESI Aspect	Impacts summary	Mitigation Measures	Mitigation objective	Risk Rating	Responsibility	Implementation action plan	Monitoring indicators.
		<p>and larvae.</p> <p>4. Apply low intake velocity to prevent impingement.</p> <p>5. Do not place the intake areas in productive areas to prevent entrainment.</p> <p>6. Ensure installation of screens on the end of the intake pipes, or the use of a screen box or shroud.</p>					<p>marine organism recovered from storage tanks, that went through the screens</p>

## **7 DECOMMISSIONING AND REHABILITATION**

The proposed development has an expected lifespan of more than 50 years. In general, the impacts associated with the decommissioning phase will be similar to that of the construction phase. The Environmental Management Plan for this phase must be reviewed at the time of decommissioning to cater for changes made to the development. At the end of its useful life, the plant will be completely dismantled so as to restore the area to *ante operam* conditions.

Generally, marine environment installations become critical habitat for marine biota. Thus, unless critical, removal of such installation may not be necessary.

## **8 CONCLUSION AND RECOMMENDATIONS**

### **8.1 Conclusion**

The construction and operation of RO seawater desalination plants are widely practised and potential impacts are well documented, providing a high confidence level in assessing associated potential impacts. It is anticipated that all potential impacts during construction phase will be temporary, short term and minimal.

The proposed RO seawater desalination plant is relatively compared to the only existing RO seawater desalination plant in Namibia, Orano Desalination Plant. When comparing the two, Orano Desalination plant has net production of treated water of 20,000,000 m<sup>3</sup>/year (54,794 m<sup>3</sup>/day), with an associated sea water abstraction rate of 48,309,179 m<sup>3</sup>/year (139,300 m<sup>3</sup>/day). The average brine volume returned to the sea is 30,999,815 m<sup>3</sup>/year (84,931 m<sup>3</sup>/day). In contrast, the proposed desalination plant will be 5 times smaller, with effluent production 6 times smaller and the freshwater output 5 times smaller than the Orano Desalination. To-date there has not been severe impact on the marine ecology as a result of the operation of Orano Desalination Plant. This provides a considerable level of assurance that the proposed RO seawater desalination will not have significant impact to the marine environment

Namibia lacks a regulatory framework for processes of desalination plant, such as the quality of brine to be discharged into the sea, suction velocity at the seawater intake points and the use of diffuser at outfall pipes to enhance effluent dilution. In leu of this, this study relied on literature and international best practises to minimize potential marine impacts.

The pipeline networks that supply seawater to the desalination plant and return effluent follow a servitude planned by the local authority. These pipelines traverse through a desert up to the beach, known for breeding the endemic bird species called the Damara Tern. The construction activities are confined within the servitude, limiting the footprint. Therefore, the impact of pipeline construction to terrestrial biodiversity will be short term and minimal.

The shoreline / intertidal areas where the inlet and outlet pipeline will be construction fall within the Namib Flyway Ecological Biological Significant Area (EBSA). This area is designated as a Strict Biodiversity Conservation Areas (SBA), where development priority is given to the strict protection of biodiversity features. This entails maintaining key biodiversity features in a natural or semi-natural state, or as near to this state as possible, through stringent. place-based protection measures to regulate human activities.

Within this area, the construction of new wastewater or desalination brine outfalls is prohibited. Additionally, the development of new permanent infrastructure such as the construction and installation of seabed structures, sea surface installations, those within the water column or adjacent to the marine area (that is above the high-water mark) including pipelines as well infrastructure connected to land-based production facilities, such as water inlets and outlets require consent. Such consent necessitates careful control through EIA process.

Impacts during the operation phase are often the key concerns associated with RO seawater desalination plants. These impacts can only be confirmed with adequate monitoring, as outlined in the monitoring program above. The regulatory authority, MFMR will play a pivotal role in monitoring water and sediment quality in the area.

## **8.2 Recommendations**

The study recommends the following to the proponent;

- i. Ensure the appoint of fulltime environmental officer during the construction and operation of the RO seawater desalination plant.
- ii. Collaborate with MFMR toward monitoring water and sediment quality
- iii. Ensure adequate implementation of the EMP
- iv. Undertake bi-annual environmental performance assessments and submit environmental audit report to the MEFT

- v. Report any modification regarding to water feed capacity or brine discharge to the competent authorities MAWLR, MFMR and MEFT that would require an amendment to the EMP.

The study further recommends the following to the competent authorities;

- i. That the MFMR set up the seawater and sediment monitoring stations at the intake and outfall area
- ii. That MEFT approve the project and issue the ECC.

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