ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP)

Algae Farming and Biorefinery Project
Production of Biofuel & Crude Algae Oil (CAO)

Project Location

Portion X, Henties Bay State Land
Dorob National Park
Erongo Region, Namibia

Project Coordinates (Site Centre)

Latitude: -22.05770; **Longitude:** 14.25485

Land Extent Approximately **28,224 hectares**

Prepared For (Proponent)

African-Link Energy Corporation (Pty) Ltd (ALEC)
(hereinafter referred to as "the Proponent")
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Document Control Statement

This document constitutes the final Environmental and Social Management Plan (ESMP) prepared for the proposed algae farming and biorefinery project at Henties Bay.

All revisions to this document shall:

- Be formally version-controlled
- Be reviewed by the Environmental Control Officer (ECO) and designated reviewer
- Be approved by the Proponent (ALEC)
- Where required, be submitted to the Ministry of Environment, Forestry and Tourism (MEFT)

Printed copies of this document are considered uncontrolled unless verified against the latest approved version.

DISCLAIMER

This Environmental and Social Management Plan (ESMP) has been prepared by Erongo Consulting Group, in collaboration with the Institute for Impact Sciences & Research Design (IISRD), on behalf of African-Link Energy Corporation (Pty) Ltd (ALEC) for submission to the Ministry of Environment, Forestry and Tourism (MEFT).

This ESMP:

- Is based on findings from the Environmental Impact Assessment (EIA) process
- Incorporates stakeholder inputs from the public participation process
- Reflects current project design, environmental conditions, and regulatory requirements

While reasonable care has been taken, the document:

- Represents conditions and knowledge available at the time of preparation
- Is subject to updates based on monitoring, audits, and regulatory requirements
- Does not replace statutory approvals or ECC conditions

Erongo Consulting Group shall not be liable for:

- Misuse of this document outside its intended regulatory purpose
- Decisions taken without reference to the full EIA and supporting studies

This ESMP must be read in conjunction with:

- The EIA Report (2026)
- ECC conditions (upon issuance)
- Applicable Namibian legislation

RECOMMENDED CITATION

Erongo Consulting Group (2026).

Environmental and Social Management Plan (ESMP) for the Algae Farming and Biorefinery Project, Portion X, Henties Bay State Land, Dorob National Park, Erongo Region, Namibia.

Prepared for **African-Link Energy Corporation (Pty) Ltd (ALEC)**.

ABBREVIATIONS AND ACRONYMS

Acronym	Meaning
ALEC	African-Link Energy Corporation
CAO	Crude Algae Oil
CAPA	Corrective and Preventative Actions
CLO	Community Liaison Officer
ECO	Environmental Control Officer
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
ESMP	Environmental and Social Management Plan
EMF	Environmental Management Framework
GRM	Grievance Redress Mechanism
I&APs	Interested and Affected Parties
IFC	International Finance Corporation
IISRD	Institute for Impact Sciences & Research Design
KPI	Key Performance Indicator
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MFMR	Ministry of Fisheries and Marine Resources
OHS	Occupational Health and Safety
QA/QC	Quality Assurance / Quality Control
RCA	Root Cause Analysis
SDGs	Sustainable Development Goals

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1 INTRODUCTION

1.1 Project Background and Overview

The proposed development entails the establishment of a large-scale, seawater-based algae cultivation and biorefinery facility for the production of biofuel and Crude Algae Oil (CAO) on Portion X of Henties Bay State Land, located within the Dorob National Park, Erongo Region, Namibia.

The project is strategically positioned within Namibia's transition toward a diversified, low-carbon, and industrialised economy, and directly responds to national priorities relating to:

- Renewable energy development and energy diversification, reducing dependence on imported fossil fuels
- Industrialisation and value addition, through the creation of a new bio-based industrial value chain
- Blue economy development, leveraging coastal and marine resources in a sustainable manner
- Climate-resilient and low-carbon development pathways, aligned with national and international commitments

The development integrates a fully coordinated system comprising:

- Seawater abstraction and intake infrastructure, designed to supply raw input for algae cultivation
- Controlled algae cultivation systems, optimised for high-yield biomass production
- Processing and refining facilities, converting biomass into CAO and biofuel products
- Supporting infrastructure, including access roads, utilities, storage facilities, and logistics systems

The project is characterised by its scale, technical complexity, and environmental interface, particularly given its:

- Location within a protected area (Dorob National Park)
- Proximity to the Atlantic Ocean and sensitive marine ecosystems
- Interaction with fragile desert ecosystems, including lichen fields

In recognition of these sensitivities, a comprehensive Environmental Impact Assessment (EIA) has been undertaken, supported by specialist studies and stakeholder engagement processes.

This Environmental and Social Management Plan (ESMP) forms a critical component of the overall environmental management framework, ensuring that identified impacts are effectively managed, monitored, and mitigated throughout the project lifecycle.

1.2 Purpose and Objectives of the ESMP

The purpose of this ESMP is to provide a structured, enforceable, and operational framework for managing environmental and social impacts associated with the project across all phases of its lifecycle.

The ESMP translates the findings of the EIA into clear, actionable commitments, ensuring that mitigation measures are not only identified but implemented, monitored, and continuously improved.

The ESMP specifically aims to:

- Operationalise EIA findings by converting identified impacts into practical mitigation and management measures
- Ensure full compliance with Namibian environmental legislation, Environmental Clearance Certificate (ECC) conditions, and applicable sectoral regulations
- Integrate stakeholder concerns and commitments into project planning, design, and implementation
- Establish robust monitoring, reporting, and accountability systems, including clearly defined roles and responsibilities
- Promote environmental stewardship, sustainable resource use, and responsible development practices
- Provide a framework for adaptive management, enabling the project to respond to changing environmental conditions, stakeholder expectations, and operational realities

The ESMP is therefore not a static compliance document, but a living management instrument, embedded within project operations and aligned with best practice environmental and social governance standards.

1.3 Scope of Application (Spatial and Temporal Boundaries)

Spatial Scope

The ESMP applies to all areas directly and indirectly influenced by the project, including:

- The primary project footprint (approximately 28,224 hectares)
- Associated infrastructure areas, including:
    - Seawater abstraction systems and pipelines
    - Access roads and internal transport routes
    - Processing, storage, and utility infrastructure
- Adjacent areas that may be affected by project activities, including:
    - Coastal and marine environments, particularly near intake zones
    - Surrounding terrestrial ecosystems, including sensitive desert habitats and lichen fields
    - Local socio-economic environments, including nearby communities, stakeholders, and economic activities

The spatial scope therefore reflects both direct and indirect zones of influence, ensuring comprehensive environmental and social management.

Temporal Scope

The ESMP applies throughout the entire project lifecycle, including:

- **Pre-construction Phase**
  Planning, detailed design, permitting, baseline surveys, and site preparation activities
- **Construction Phase**
  Site clearing, infrastructure development, installation of systems, and increased workforce presence
- **Operational Phase**
  Full-scale algae cultivation, processing, refining, and ongoing site management
- **Decommissioning Phase**
  Decommissioning of infrastructure, site rehabilitation, and environmental restoration

The temporal scope ensures that impacts are managed not only during active operations but also during transitional and closure stages, which often present significant environmental risks.

1.4 Integration with the Environmental Impact Assessment (EIA)

This ESMP is directly informed by, and aligned with, the findings of the Environmental Impact Assessment (EIA), ensuring a seamless transition from assessment to implementation.

In particular, the ESMP draws on:

- **Chapter 8: Impact Identification and Assessment**, which defines the nature, significance, and extent of potential impacts
- **Chapter 9: Public Participation Process**, which captures stakeholder concerns, expectations, and inputs

The ESMP operationalises these findings by:

- Translating identified impacts into specific mitigation and management measures
- Embedding stakeholder concerns into project commitments and management plans
- Incorporating recommendations from specialist studies (marine, botanical, water quality, etc.)

A direct and traceable linkage is maintained through:

- Impact–mitigation–monitoring relationships, ensuring that each identified impact is addressed
- Issue-based management measures, linked to stakeholder Issue IDs
- Integration across ESMP sections, ensuring consistency and accountability

This approach ensures that the ESMP is:

- **Traceable** (linked to EIA findings)
- **Evidence-based** (grounded in data and specialist input)
- **Responsive** (aligned with stakeholder concerns)
- **Implementable** (structured for operational use)

1.5 ESMP Update and Review Process

The ESMP is designed as a dynamic and adaptive management tool, subject to periodic review and updating to ensure continued relevance, effectiveness, and compliance.

Review Triggers

The ESMP will be reviewed and, where necessary, updated under the following circumstances:

- Issuance, amendment, or revision of Environmental Clearance Certificate (ECC) conditions
- Significant changes in project design, scale, or operational processes
- Occurrence of environmental incidents, non-compliance events, or near misses
- Outcomes of environmental monitoring, audits, or inspections
- Stakeholder feedback, grievances, or emerging concerns
- Changes in applicable legislation, standards, or regulatory requirements

Review Frequency

- **Construction Phase:** Quarterly reviews or as required based on site conditions
- **Operational Phase:** Annual reviews, with additional updates as required
- **Post-incident:** Immediate review following significant environmental or social incidents

Update Responsibility

- The Project Proponent retains overall responsibility for updating and implementing the ESMP
- The Environmental Control Officer (ECO) will:
    - Monitor implementation
    - Identify required updates
    - Provide recommendations
- Relevant updates may require review and approval by regulatory authorities

Adaptive Management Approach

The ESMP adopts an **adaptive management framework**, ensuring that environmental and social management evolves in response to real-world conditions.

This approach is based on a continuous cycle of:

Monitoring → Evaluation → Adjustment → Improvement

Specifically:

- **Monitoring results** are used to assess environmental performance and compliance
- **Performance gaps or emerging risks** are identified through audits and inspections
- **Management measures are refined** to improve effectiveness
- **Lessons learned** are incorporated into ongoing project operations

This ensures that the project maintains:

- **Operational flexibility**
- **Environmental responsiveness**
- **Continuous improvement in performance**

2 PROJECT DESCRIPTION

2.1 Site Location and Layout (Henties Bay Context)

The proposed project is located on Portion X of Henties Bay State Land, within the Dorob National Park, Erongo Region, Namibia. The site lies along the C34 coastal trunk road corridor linking Swakopmund, Henties Bay, and Terrace Bay, and is situated approximately 50 metres inland from the Atlantic Ocean.

The location is characterised by:

- Arid desert climatic conditions, including low rainfall and high evaporation
- Ecologically sensitive terrestrial systems, including lichen fields and desert-adapted vegetation
- Proximity to marine ecosystems, including nearshore fisheries and coastal processes
- Limited existing land use and infrastructure, providing a relatively undeveloped baseline

The site falls within a protected area (Dorob National Park), which introduces heightened environmental sensitivity and requires strict adherence to conservation and regulatory requirements.

2.1.1 Geographic Coordinates

The approximate central coordinates of the project site are:

- **Latitude:** -22.05770
- **Longitude:** 14.25485

These coordinates represent the central reference point of the development area. Detailed spatial boundaries and infrastructure layouts are provided in the figures below and in Appendix E (Maps and Layout Plans).

2.1.2 Project Layout and Spatial Configuration

The project occupies an extensive land area of approximately 28,224 hectares, enabling the development of a large-scale, integrated algae production system.

The conceptual layout includes the following key components:

- Seawater abstraction infrastructure located at or near the coastline
- Pipeline systems transporting seawater inland
- Algae cultivation zones, distributed across the site
- Processing and biorefinery facilities, centrally located
- Storage and logistics infrastructure, including product handling areas
- Internal road networks and utilities, supporting operational efficiency

The layout has been informed by:

- Environmental constraints identified in the EIA
- Stakeholder concerns (particularly marine access and biodiversity protection)
- Technical and operational requirements

2.1.3 Spatial Context and Environmental Sensitivity

The project area is located within a highly sensitive environmental context, including:

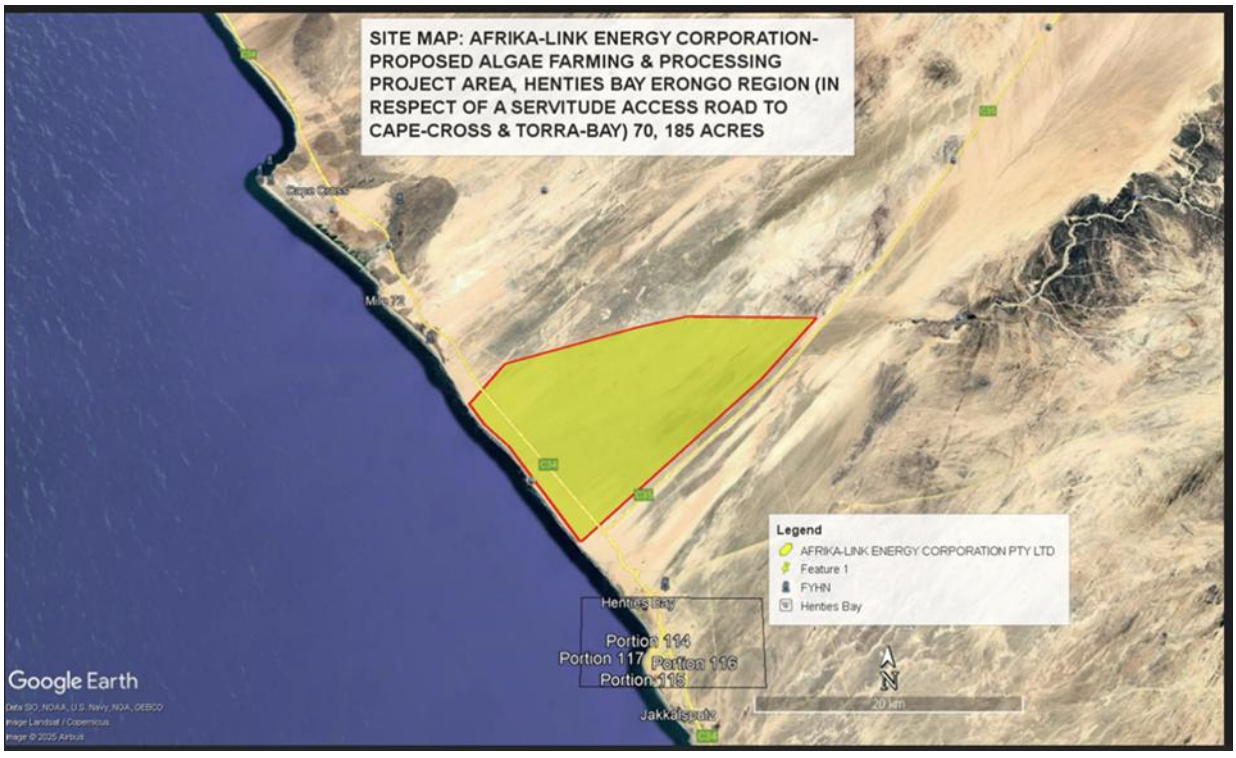
- Dorob National Park, requiring compliance with conservation regulations
- Coastal ecosystems, influenced by marine dynamics and fisheries
- Fragile desert ecosystems, particularly lichen fields with slow recovery rates

As a result, the spatial configuration of the project has been designed to:

- Avoid or minimise disturbance to sensitive areas
- Maintain coastal access where feasible
- Integrate environmental safeguards into infrastructure planning

2.1.4 Maps and Spatial Representation

Figure 1: Project Site Location Map – Proposed Algae Farming and Processing Area, Henties Bay (Erongo Region)



2.2 Description of Project Phases

The ESMP is structured around the four key phases of the project lifecycle, each associated with specific activities, risks, and management requirements.

2.2.1 Pre-construction and Site Preparation

Key Activities

- Finalisation of engineering design and layout
- Environmental permitting and regulatory approvals
- Baseline surveys (e.g., lichen mapping, marine assessments)
- Site demarcation and establishment of no-go zones
- Contractor selection and mobilisation planning

Environmental and Social Considerations

- Accurate identification and protection of sensitive ecological areas
- Integration of mitigation measures into project design
- Early stakeholder engagement and communication
- Establishment of environmental management systems

Management Focus

- Avoidance of impacts through informed planning
- Establishment of compliance systems prior to construction

2.2.2 Construction Activities

Key Activities

- Site clearing and preparation
- Construction of roads and infrastructure
- Installation of pipelines and intake systems
- Development of cultivation and processing facilities
- Workforce mobilisation

Environmental and Social Considerations

- Disturbance to terrestrial habitats, especially lichen fields
- Dust, noise, and emissions
- Waste generation and management
- Potential restriction of coastal access
- Occupational health and safety risks

Management Focus

- Enforcement of no-go zones and environmental controls

- Waste and pollution management
- Active supervision by Environmental Control Officer (ECO)
- Ongoing stakeholder engagement

2.2.3 Operational Phase (Algae Cultivation & Biorefinery Processes)

Key Activities

- Continuous seawater abstraction
- Algae cultivation and biomass production
- Processing and refining into CAO and biofuel
- Storage and transport of products
- Routine maintenance and operations

Environmental and Social Considerations

- Marine ecosystem interactions
- Water quality variability (e.g., sulfur events)
- Waste and by-product management
- Long-term stakeholder engagement
- Resource efficiency

Management Focus

- Implementation of monitoring programmes (marine, water, biodiversity)
- Maintenance of pollution control systems
- Adaptive management and continuous improvement
- Sustained socio-economic contributions

2.2.4 Decommissioning and Closure

Key Activities

- Removal of infrastructure
- Site rehabilitation
- Waste disposal and recycling
- Environmental restoration

Environmental and Social Considerations

- Residual environmental impacts
- Land rehabilitation and ecosystem recovery
- Long-term environmental stability

Management Focus

- Implementation of structured decommissioning plan
- Restoration of site conditions

- Post-closure monitoring

2.3 Resource Requirements (Seawater, Energy, Chemicals, Labour)

The project requires a range of resources across all phases, which must be managed efficiently to minimise environmental impacts.

2.3.1 Seawater

- Primary input for algae cultivation
- Abstracted from the Atlantic Ocean
- Managed to minimise ecological disturbance

2.3.2 Energy

- Required for pumping, processing, and operations
- Sourced from grid and/or supplementary systems
- Efficiency measures to be incorporated

2.3.3 Chemicals and Process Inputs

- Limited use of process chemicals
- Controlled storage, handling, and disposal
- Compliance with safety and environmental standards

2.3.4 Labour

- Workforce required across all phases
- Includes skilled and unskilled labour

Focus areas:

- Local employment
- Skills development
- Occupational health and safety

2.3.5 Resource Management Considerations

Effective management of resources will ensure:

- Environmental sustainability
- Operational efficiency
- Compliance with regulatory requirements

Key considerations include:

- Minimising resource wastage
- Preventing contamination and pollution
- Safe handling and storage of materials
- Alignment with environmental constraints

3 LEGAL, POLICY, AND INSTITUTIONAL FRAMEWORK

3.1 National Legislation (Namibia)

The proposed project is governed by a range of national environmental, natural resource, and sector-specific legislation. Compliance with these legal instruments is mandatory and forms the foundation of the Environmental and Social Management Plan (ESMP).

3.1.1 Environmental Management Act (Act No. 7 of 2007)

The Environmental Management Act (EMA) provides the overarching legal framework for environmental management in Namibia.

Key provisions relevant to the project include:

- Requirement for Environmental Impact Assessment (EIA) prior to commencement of listed activities
- Issuance of an Environmental Clearance Certificate (ECC) as a prerequisite for project implementation
- Application of environmental management principles, including:
    - Sustainable use of natural resources
    - Prevention of environmental degradation
    - Public participation in decision-making

The Act places responsibility on the proponent to ensure that environmental impacts are properly assessed, managed, and monitored throughout the project lifecycle.

3.1.2 Environmental Impact Assessment Regulations (2012)

The EIA Regulations, promulgated under the EMA, provide detailed procedural requirements for environmental assessment and management.

Key requirements include:

- Identification of listed activities requiring environmental clearance
- Conduct of public participation processes
- Preparation and submission of Scoping Reports and Environmental Impact Assessments
- Development of an Environmental Management Plan (EMP/ESMP)
- Ongoing monitoring and compliance reporting

These regulations form the basis for both the EIA undertaken for this project and the development of this ESMP.

3.1.3 Marine Resources Act & Water Resources Management Act

Marine Resources Act (Act No. 27 of 2000)

This Act governs the protection and sustainable utilisation of Namibia's marine resources.

Relevance to the project includes:

- Protection of marine ecosystems and fisheries
- Regulation of activities that may affect marine biodiversity and fish stocks
- Oversight by the Ministry of Fisheries and Marine Resources (MFMR)

The project must ensure that seawater abstraction and coastal activities do not adversely affect marine ecosystems or fisheries.

Water Resources Management Act (Act No. 11 of 2013)

This Act regulates the use, management, and protection of water resources in Namibia.

Key considerations include:

- Sustainable abstraction and use of water resources
- Prevention of water pollution and contamination
- Requirement for permits where applicable

Although the project utilises seawater, the Act remains relevant in ensuring responsible water use and environmental protection.

3.2 International Standards and Guidelines

In addition to national legislation, the project is aligned with international environmental and social best practice standards, particularly where financing or benchmarking requires compliance.

International Finance Corporation (IFC) Performance Standards

The IFC Performance Standards provide a globally recognised framework for managing environmental and social risks.

Relevant standards include:

- **PS1:** Assessment and Management of Environmental and Social Risks
- **PS3:** Resource Efficiency and Pollution Prevention
- **PS4:** Community Health, Safety, and Security
- **PS6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources

These standards inform:

- Risk management approaches
- Stakeholder engagement processes
- Biodiversity and resource management practices

World Bank Group Environmental, Health and Safety (EHS) Guidelines

The World Bank EHS Guidelines provide technical reference standards for environmental performance, including:

- Pollution prevention and control
- Waste management
- Occupational health and safety
- Industrial process management

These guidelines are used to:

- Benchmark environmental performance
- Inform mitigation and monitoring measures
- Support international best practice implementation

3.3 Permits, Licenses, and Environmental Clearance Certificate (ECC) Conditions

The implementation of the project is subject to obtaining and complying with all required permits and approvals.

Environmental Clearance Certificate (ECC)

The ECC, issued by the Ministry of Environment, Forestry and Tourism (MEFT), is the primary regulatory approval required for the project.

Key conditions typically include:

- Implementation of the approved ESMP
- Compliance with mitigation and monitoring requirements
- Submission of periodic environmental monitoring reports
- Adherence to conditions related to biodiversity, water use, and pollution control

The ECC serves as a legally binding instrument, and all project activities must comply with its conditions.

Other Permits and Approvals

Depending on project design and implementation, additional permits may be required, including:

- Coastal and marine-related approvals (MFMR)
- Water use or abstraction permits (if applicable)
- Land use and development approvals
- Infrastructure and transport-related permits

The proponent is responsible for ensuring that all required permits are obtained prior to commencement of relevant activities.

3.4 Compliance and Enforcement Framework

The ESMP establishes a formal compliance and enforcement framework to ensure that all environmental and social obligations are implemented effectively.

Legal Status of the ESMP

- The ESMP forms part of the EIA approval process
- Once approved, it becomes legally binding through the ECC
- All mitigation and management measures contained herein are mandatory

Compliance Obligations

All parties involved in the project are required to comply with:

- ESMP provisions
- ECC conditions
- Applicable national legislation
- Relevant international standards (where applicable)

This includes:

- The Proponent
- Contractors and sub-contractors
- Operational staff

Enforcement Mechanisms

Compliance will be enforced through:

- Regular environmental monitoring and inspections
- Oversight by the Environmental Control Officer (ECO)
- Internal and external audits
- Regulatory inspections by competent authorities

Non-Compliance and Corrective Action

In the event of non-compliance:

- Immediate corrective actions must be implemented
- Incidents must be documented and reported
- Repeated or significant non-compliance may result in:
    - Suspension of activities
    - Penalties or enforcement actions
    - Review or withdrawal of the ECC

Contractual Enforcement

Environmental and social requirements will be embedded within:

- Contractor agreements
- Method statements
- Site-specific procedures

This ensures that compliance is not optional, but contractually enforceable.

Compliance Monitoring and Reporting

Compliance will be tracked through:

- Environmental monitoring programmes
- Regular reporting (monthly, quarterly, annual)
- Incident and non-compliance registers

3.5 Summary

The legal, policy, and institutional framework establishes a robust foundation for environmental governance, ensuring that:

- The project operates within clear legal boundaries
- Environmental and social risks are properly managed
- Compliance is monitored, enforced, and documented

This framework supports the effective implementation of the ESMP and underpins the overall environmental sustainability and regulatory acceptability of the project.

4 INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

4.1 Organizational Structure for Environmental and Social Management

Effective implementation of the ESMP requires a clearly defined institutional structure with unambiguous lines of authority, reporting, and accountability.

The project will establish an Environmental and Social Management Structure comprising:

- Project Proponent / Project Management Team (overall responsibility)
- Environmental Control Officer (ECO) (independent monitoring and compliance oversight)
- Contractors and Sub-contractors (implementation at site level)
- Specialist Advisors (as required for marine, biodiversity, or technical inputs)
- Regulatory Authorities (external oversight and compliance enforcement)

Organisational Hierarchy (Functional)

- **Proponent (Project Director / Environmental Manager)**
  ↓
- **Environmental Control Officer (ECO)** *(independent oversight)*
  ↓
- **Contractors / Site Management Teams**
  ↓
- **Operational Staff and Workers**

Key Principles of the Structure

- **Accountability:** The Proponent retains ultimate responsibility for ESMP compliance
- **Independence:** The ECO operates with sufficient independence to enforce compliance
- **Integration:** Environmental management is embedded into all project functions
- **Traceability:** All actions, decisions, and incidents are documented and reportable

4.2 Roles and Responsibilities

4.2.1 The Proponent (Project Management)

The Proponent is ultimately responsible for the implementation, compliance, and performance of the ESMP.

Key Responsibilities

- Ensure full compliance with:
  - ESMP requirements
  - Environmental Clearance Certificate (ECC) conditions
  - Applicable legislation
- Allocate adequate:
  - Financial resources
  - Personnel and technical capacity
- Appoint and support:
  - Environmental Control Officer (ECO)
  - Qualified contractors and specialists
- Integrate environmental management into:
  - Project planning
  - Design
  - Operational decision-making
- Ensure:
  - Regular environmental monitoring
  - Timely reporting to authorities
  - Response to stakeholder concerns
- Maintain oversight of:
  - Contractor compliance
  - Environmental performance

4.2.2 The Contractor / Sub-contractors

Contractors are responsible for day-to-day implementation of ESMP measures during construction and relevant operational activities.

Key Responsibilities

- Comply with all:
  - ESMP requirements
  - Site-specific environmental procedures
  - Method statements
- Implement:
  - Environmental controls (dust, waste, access, etc.)
  - Safety and pollution prevention measures
- Ensure that all workers:
  - Receive environmental induction training
  - Understand site-specific environmental risks
- Maintain:
  - Site records (waste logs, incident reports, etc.)
  - Environmental compliance documentation
- Immediately report:
  - Incidents
  - Non-compliance events

4.2.3 The Environmental Control Officer (ECO)

The ECO is responsible for independent monitoring, auditing, and enforcement of environmental compliance.

Key Responsibilities

- Conduct regular:
  - Site inspections
  - Compliance audits
- Verify implementation of:
  - ESMP measures
  - ECC conditions
- Monitor:
  - Environmental performance
  - Compliance with no-go areas
  - Waste and pollution controls
- Issue:
  - Corrective action instructions
  - Non-compliance notices
- Maintain:
  - Environmental records and registers
- Report to:
  - Proponent
  - Regulatory authorities (as required)

Authority of the ECO

The ECO shall have the authority to:

- Instruct corrective measures
- Recommend suspension of activities in case of serious non-compliance
- Escalate issues to regulatory authorities

4.2.4 External Auditors and Regulatory Authorities

Regulatory Authorities

Authorities such as:

- Ministry of Environment, Forestry and Tourism (MEFT)
- Ministry of Fisheries and Marine Resources (MFMR)
- Ministry of Agriculture, Water and Land Reform

are responsible for:

- Oversight and enforcement of compliance
- Review of monitoring reports
- Conducting inspections

External Auditors

Where required, independent auditors may be engaged to:

- Conduct environmental compliance audits
- Evaluate ESMP performance
- Provide recommendations for improvement

4.3 Communication and Reporting Channels

Effective communication is critical for ensuring coordination, transparency, and timely response to issues.

Internal Communication

- Daily communication between:
  - Contractors
  - Site supervisors
  - Environmental personnel
- Regular meetings:
  - Site environmental briefings
  - Toolbox talks

External Communication

- Reporting to:
  - Regulatory authorities
  - Stakeholders (as required)
- Communication of:
  - Project updates
  - Environmental performance
  - Incident notifications

Reporting Structure

Level	Reporting Responsibility
Contractor → ECO	Daily/weekly reporting
ECO → Proponent	Weekly/monthly reports
Proponent → Authorities	Periodic compliance reports

Incident Reporting

All environmental incidents must be:

- Reported immediately to the ECO
- Logged in an incident register
- Investigated and resolved
- Reported to authorities where required

4.4 Contractor Environmental and Social Management Requirements

To ensure effective implementation of the ESMP, all contractors must adhere to strict environmental and social management requirements.

4.4.1 Pre-Commencement Requirements

Before commencing work, contractors must:

- Submit method statements for approval, including:
  - Construction procedures
  - Environmental protection measures
  - Waste management plans
- Attend site induction training, covering:
  - Environmental sensitivities (e.g., lichen areas)
  - Compliance requirements
  - Emergency procedures

4.4.2 Site Compliance Requirements

Contractors must:

- Adhere to all no-go zones and buffer areas
- Prevent pollution and environmental damage
- Maintain proper waste handling and disposal practices
- Ensure safe storage and handling of materials

4.4.3 Monitoring and Supervision

- Contractors will be subject to:
  - Continuous monitoring by the ECO
  - Routine inspections and audits
- Non-compliance will result in:
  - Corrective actions
  - Possible penalties
  - Suspension of activities (if necessary)

4.4.4 Environmental Awareness and Training

Contractors must ensure:

- All personnel receive:
  - Environmental induction training
  - Ongoing awareness sessions
- Workers understand:
  - Environmental risks

- Site-specific rules
- Reporting procedures

4.4.5 Record Keeping

Contractors must maintain:

- Environmental compliance records
- Waste disposal records
- Incident and accident reports
- Training attendance records

4.5 Summary

The institutional framework ensures that:

- Roles and responsibilities are clearly defined and enforceable
- Environmental management is integrated into project operations
- Compliance is monitored, reported, and enforced
- Stakeholder and regulatory expectations are effectively addressed

This structure provides the foundation for effective implementation of the ESMP across all project phases.

5 ENVIRONMENTAL & SOCIAL MANAGEMENT PROGRAMME (MANAGEMENT MATRIX)

Approach

This section consolidates all mitigation and management measures into phase-specific, implementable actions linked to:

- Identified impacts (Chapter 8)
- Stakeholder issues (Chapter 9 – Issue IDs)
- Monitoring indicators (KPIs)
- Responsible parties

Each sub-plan is structured under:

- Pre-Construction Measures
- Construction Measures
- Operational Measures
- Decommissioning Measures
- KPIs & Monitoring
- Responsibility

5.1 Marine Environment Management Plan (FM1–FM5)

(Intake/Outfall & Coastal Dynamics)

Key Risks

- Entrainment/impingement at intake
- Localised ecosystem disturbance
- Interference with fishing access
- Cumulative marine pressure

Pre-Construction

- Finalise intake location/design using ecological inputs
- Undertake baseline marine survey (species, turbidity, currents)
- Engage fishing stakeholders on access routes

Construction

- Install silt/erosion controls near shoreline works
- Avoid works during sensitive periods (if identified)
- Maintain public coastal access corridors

Operation

- Use low-velocity screened intake systems
- Implement marine monitoring programme (plankton, turbidity, observations)
- Maintain no-discharge system (no return flows to ocean)
- Continuous engagement with fishing stakeholders

Decommissioning

- Remove intake structures
- Restore shoreline to pre-project condition where feasible

KPIs & Monitoring

- Intake velocity within design limits
- No recorded fish kills / significant entrainment events
- Access routes remain open (verified)
- Marine monitoring reports (quarterly)

Responsibility

Proponent / Operator, ECO, Marine Specialist

5.2 Terrestrial Biodiversity Management Plan (ES1–ES2)

(Lichen and Coastal Flora)

Key Risks

- Irreversible damage to lichen fields
- Habitat fragmentation

Pre-Construction

- Conduct detailed lichen mapping
- Establish no-go zones and buffers (GPS demarcated)
- Integrate avoidance into final layout

Construction

- Restrict vehicles to designated routes only
- ECO to supervise all clearing activities
- Install physical demarcation (stakes/signage**)**

Operation

- Maintain restricted access areas
- Periodic biodiversity inspections

Decommissioning

- Rehabilitate disturbed areas (as feasible in arid systems)

KPIs & Monitoring

- Zero disturbance in no-go zones
- Area of disturbance vs approved footprint
- Compliance inspections (weekly during construction)

Responsibility

Contractor (implementation), ECO (oversight), Proponent

5.3 Water and Wastewater Management (WM1–WM3)

(Desalination & Effluent Control)

Key Risks

- Contamination of marine or terrestrial environments
- Poor water quality management

Pre-Construction

- Finalise **water management design** (zero-discharge principle)
- Identify storage and containment systems

Construction

- Prevent runoff contamination
- Use bunded storage for fuels/chemicals

Operation

- Maintain closed-loop / zero-discharge systems
- Monitor water quality parameters
- Implement spill prevention systems

Decommissioning

- Remove storage systems
- Ensure no residual contamination

KPIs & Monitoring

- No unauthorised discharge
- Water quality within acceptable limits

- Incident-free operations

Responsibility

Operator, ECO

5.4 Waste Management Plan (WM1–WM3)

(Solid, Hazardous, and Biological)

Key Risks

- Improper disposal
- Pollution

Pre-Construction

- Develop **Waste Management Plan**
- Identify licensed disposal facilities

Construction

- Segregate waste (general, hazardous)
- Provide waste bins and storage areas

Operation

- Routine waste collection and disposal
- Maintain waste registers

Decommissioning

- Remove all waste and materials

KPIs & Monitoring

- Waste segregation compliance
- Disposal records maintained
- No illegal dumping

Responsibility

Contractor / Operator, ECO

5.5 Biosecurity and Alien Invasive Species Protocol (BS1–BS2)

Key Risks

- Introduction or escape of non-native species

Measures

- Use indigenous algae species only
- Controlled cultivation systems
- Biosecurity protocols (cleaning, containment)

KPIs

- Zero invasive species incidents

5.6 Air Quality and Noise Management

Key Risks

- Dust during construction
- Noise disturbance

Measures

- Dust suppression (water spraying)
- Limit noisy activities to daytime
- Maintain equipment

KPIs

- Dust levels controlled
- Noise complaints minimal

5.7 Socio-Economic Management Plan (SD1–SD3)

Key Risks

- Community dissatisfaction
- Unrealistic expectations

Measures

- Prioritise local employment
- Implement training programmes
- CSR initiatives (e.g., water support, skills development)

- Continuous stakeholder engagement

KPIs

- % local employment
- Number of training beneficiaries
- Stakeholder satisfaction

5.8 Occupational Health and Safety (OHS) Plan

Key Risks

- Worker injuries
- Unsafe conditions

Measures

- Safety training
- PPE provision
- Incident reporting system

KPIs

- Lost Time Injury Frequency Rate (LTIFR)
- Number of incidents

5.9 Cultural Heritage and "Chance Find" Procedures

Measures

- Stop work immediately if artefacts are found
- Notify relevant authorities
- Resume work only after clearance

EXPANDED IMPACT–MITIGATION–MONITORING MATRIX

Marine Environment – Seawater Abstraction & Ecological Disturbance

Impact (Ch.8)	Issue ID	Mitigation Measure (Expanded)	Phase	KPI / Performance Indicator	Monitoring Method	Frequency	Responsibility
Marine disturbance (entrainment/impingement of marine organisms)	FM1	Design and install low-velocity intake systems (<0.15 m/s) with screening mechanisms to minimise entrainment; position intake in low-sensitivity marine zones; avoid spawning areas	Design / Operation	• No recorded fish kills • Intake velocity compliance • No ecological incidents	• Marine inspections • Intake velocity measurement • Incident reporting system	Monthly / Continuous	Operator / ECO
Marine ecosystem disruption from abstraction	FM2	Limit abstraction volumes within approved thresholds; implement real-time flow monitoring systems; align abstraction with ecological tolerance limits	Operation	• Compliance with abstraction limits • No measurable decline in marine indicators	• Flow meters • Marine ecological monitoring	Continuous / Quarterly	Operator / MFMR Liaison

Terrestrial Biodiversity – Lichen and Desert Ecosystems

Impact	Issue ID	Mitigation Measure	Phase	KPI	Monitoring Method	Frequency	Responsibility
Lichen and sensitive habitat disturbance	ES1	Establish **demarcated no-go zones** using GPS and physical	Pre-Construction / Construction	• Zero disturbance within protected zones	• ECO inspection • Site audits	Weekly	Contractor / ECO

		markers; pre-construction **ecological walkdown surveys**; enforce **restricted access protocols**		• No unauthorised access incidents	• GIS verification		
Habitat degradation from vehicle movement	ES2	Define **controlled access routes**; prohibit off-road driving; implement **driver awareness training**	Construction	• No off-track vehicle incidents • Compliance with designated routes	• Site inspections • Incident logs	Weekly	Contractor / ECO

Land Use & Coastal Access

Impact	Issue ID	Mitigation Measure	Phase	KPI	Monitoring Method	Frequency	Responsibility
Restricted coastal access affecting fishing and tourism	FM3	Maintain designated public access corridors; install signage; engage local stakeholders on access arrangements; ensure uninterrupted access unless safety restrictions apply	All Phases	• Access routes maintained • No validated complaints on restricted access	• Stakeholder feedback • Site inspections	Monthly	Proponent / CLO
Land use conflict and visual intrusion	LU1	Implement buffer zones between infrastructure and sensitive areas; maintain setback distances from coastline	Design / Construction	• Compliance with spatial layout approvals	• GIS verification • Site audits	Quarterly	Proponent / ECO

Water Quality & Pollution Control

Impact	Issue ID	Mitigation Measure	Phase	KPI	Monitoring Method	Frequency	Responsibility
Pollution risk (effluent discharge, contamination)	WM1	Implement closed-loop, zero-discharge system; ensure all process water is recycled or treated; install containment infrastructure	Operation	• Zero discharge to marine environment • No contamination incidents	• Water quality testing • System audits	Monthly	Operator / ECO
Accidental spills (chemicals, fuels)	WM2	Develop and implement Spill Prevention and Response Plan; provide spill kits; train personnel	Construction / Operation	• Zero uncontrolled spills • Response time < 1 hour	• Incident reports • Inspection records	Continuous	Contractor / Operator

Socio-Economic & Community Impacts

Impact	Issue ID	Mitigation Measure	Phase	KPI	Monitoring Method	Frequency	Responsibility
Community expectations and social risk	SD1	Implement structured stakeholder engagement programme; maintain GRM; provide regular updates and feedback mechanisms	All Phases	• All grievances logged and resolved within timelines • Stakeholder satisfaction maintained	• GRM database • Engagement records	Monthly / Quarterly	Proponent / CLO
Employment expectations and inclusion	SD2	Prioritise local employment; implement transparent recruitment	Construction / Operation	• % local employment achieved	• HR records • Employment audits	Quarterly	Proponent

		processes; provide skills development programmes		• Training programmes implemented			

Operational Risk & System Resilience

Impact	Issue ID	Mitigation Measure	Phase	KPI	Monitoring Method	Frequency	Responsibility
Water quality variability (e.g., sulphur events)	OP1	Install real-time water quality monitoring systems; develop contingency protocols for intake shutdown	Operation	• No system failure due to water quality • Compliance with operational thresholds	• Sensor data • System logs	Continuous	Operator
System failure or infrastructure breakdown	OP2	Implement preventative maintenance programme; maintain redundancy systems	Operation	• System uptime > 95%	• Maintenance logs	Monthly	Operator

5.10 Summary

This management programme ensures that:

- All impacts are linked to clear mitigation measures
- Responsibilities are defined and enforceable
- Monitoring is measurable and auditable
- Stakeholder concerns are operationalised

6 STAKEHOLDER ENGAGEMENT & GRIEVANCE REDRESS

6.1 Ongoing Stakeholder Engagement Strategy

Stakeholder engagement is a continuous process that extends beyond the EIA phase into construction, operation, and decommissioning. The objective is to ensure that Interested and Affected Parties (I&APs) remain:

- Informed about project activities
- Consulted on matters affecting them
- Able to provide input and feedback
- Confident in the project's transparency and responsiveness

6.1.1 Key Stakeholder Groups

The project engages with a diverse range of stakeholders, including:

- Local communities (Henties Bay and surrounding areas)
- Fishing communities and marine users
- Local authorities and regional governance structures
- Government ministries and regulatory agencies
- Academic and research institutions
- Civil society organisations and NGOs
- Business and tourism stakeholders

6.1.2 Engagement Objectives

The ongoing engagement strategy aims to:

- Maintain transparent communication throughout all project phases
- Provide timely updates on project progress and activities
- Identify and respond to emerging concerns and risks
- Strengthen community trust and project acceptance
- Facilitate collaborative problem-solving where needed

6.1.3 Engagement Methods

Engagement will be undertaken through multiple channels, including:

- Public meetings and stakeholder workshops
- Targeted consultations with key stakeholder groups (e.g., fishing sector)
- Email and formal correspondence
- Site notices and public information boards

- Periodic project updates and reports
- One-on-one engagements where necessary

Table 1: **Stakeholder Engagement Matrix (Operationalised)**

Project Phase	Engagement Focus	Key Activities (Detailed)	Stakeholders Targeted	Engagement Methods	KPIs / Performance Indicators	Frequency	Responsibility
Pre-Construction Phase							
Pre-construction	Project awareness and expectations management	• Public disclosure of project scope and timelines • Clarification of land use, footprint, and impacts • Management of expectations regarding employment and benefits • Introduction of GRM system • Stakeholder mapping and database development	• Local communities (Henties Bay) • Fishing sector • Local authorities • NGOs and civil society • Research institutions	• Public meetings • Stakeholder workshops • Notices and posters • Emails and formal communication	• Stakeholder register established • % of key stakeholders engaged • Number of awareness meetings conducted • GRM operational before construction	Once-off intensive + follow-ups	Proponent / EAP / CLO
Construction Phase							
Construction	Managing disruptions, access, and employment	• Communication of construction schedules and activities • Notification of temporary	• Local community • Fishing sector	• Site notice boards • Toolbox talks • Community briefings	• Number of grievances received/resolved • Response time compliance (≤14–30 days)	Monthly / Continuous	Contractor / CLO / Proponent

		disruptions (noise, dust, access) • Engagement on coastal access routes • Transparent recruitment and employment processes • Handling grievances related to construction impacts	• Workers and job seekers • Local businesses	• GRM channels (hotline/email)	• % local employment achieved • Number of access-related complaints		

Operational Phase

Operation	Long-term engagement and performance communication	• Regular disclosure of environmental monitoring results • Ongoing stakeholder consultations • Reporting on project performance (environmental and socio-economic) • Maintenance of GRM and feedback systems • Partnerships with research and academic institutions	• Local communities • Regulatory authorities • Academic/research institutions • NGOs	• Periodic stakeholder meetings • Reports and newsletters • Digital communication platforms • One-on-one consultations	• Stakeholder satisfaction levels • Number of engagements conducted • GRM resolution rate • Transparency of reporting (timely disclosures)	Quarterly / Biannual	Operator / Proponent / CLO

Decommissioning Phase

Decommissioning	Closure planning and rehabilitation expectations	• Communication of closure timelines and activities • Engagement on land rehabilitation and future land use • Management of employment transition impacts • Final stakeholder consultations and closure reporting	• Local communities • Employees • Authorities • Land users	• Public meeting • Closure reports • Stakeholder consultations	• Stakeholder awareness of closure plan • Number of closure-related grievances resolved • Acceptance of rehabilitation outcomes		

6.1.4 Stakeholder Register and Documentation

A Stakeholder Register will be maintained, including:

- Stakeholder details and contact information
- Nature of interest or concern
- Record of engagements and communications

All engagement activities will be documented and archived for transparency and audit purposes.

6.2 Grievance Redress Mechanism (GRM)

A formal Grievance Redress Mechanism (GRM) will be established to ensure that stakeholders have access to a clear, transparent, and accessible process for raising concerns or complaints.

The GRM is designed to:

- Provide a structured platform for lodging grievances
- Ensure timely and fair resolution of issues
- Promote accountability and transparency
- Reduce conflict and enhance stakeholder trust

6.2.1 Lodging and Tracking Procedures

Stakeholders may submit grievances through multiple channels, including:

- Written submissions (email or letter)
- Verbal communication (recorded by project personnel)
- Community liaison channels
- Public meetings or consultations

Grievance Handling Process

1. **Receipt of Grievance**
    - Grievance is received and recorded
2. **Registration**
    - Logged in a **Grievance Register** with a unique reference number
3. **Acknowledgement**
    - Acknowledged within a defined timeframe
4. **Assessment and Investigation**
    - Nature and validity of grievance assessed
    - Relevant parties consulted
5. **Resolution and Response**
    - Appropriate corrective action identified and implemented
6. **Closure**

- Grievance closed once resolved and communicated to complainant

Grievance Register

The register will include:

- Date of submission
- Stakeholder details
- Nature of complaint
- Actions taken
- Status (open/closed)

6.2.2 Resolution Timelines

To ensure efficiency and accountability, the following timelines will apply:

Table 2: Resolution Timelines

Stage	Timeline
Acknowledgement of grievance	Within 3–5 working days
Initial assessment	Within 7 working days
Resolution (where feasible)	Within 14–30 working days
Complex cases	Extended timeframe with stakeholder notification

Escalation Process

If a grievance is not resolved satisfactorily:

- It may be escalated internally to senior management
- External mediation may be considered
- Regulatory authorities may be engaged where required

6.3 Community Liaison and Information Disclosure

6.3.1 Community Liaison Function

A dedicated community liaison function will be established to:

- Serve as the primary interface between the project and local stakeholders
- Facilitate ongoing communication and engagement
- Support grievance handling processes

This may include the appointment of a Community Liaison Officer (CLO).

6.3.2 Information Disclosure

The project commits to transparent and timely disclosure of relevant information, including:

- Project updates and milestones
- Environmental performance and monitoring results
- Changes to project design or operations
- Outcomes of stakeholder engagement

Disclosure Methods

- Public notices and community boards
- Digital communication (email, online platforms)
- Stakeholder meetings and briefings
- Reports and summaries made available to stakeholders

6.3.3 Accessibility and Inclusivity

Efforts will be made to ensure that:

- Information is accessible and understandable
- Engagement processes are inclusive of all stakeholder groups
- Vulnerable or marginalised groups are adequately represented

6.3.4 Record Keeping

All stakeholder engagement and grievance-related activities will be:

- Documented
- Maintained in a structured database
- Available for review by regulators and auditors

6.3.5 Summary

The stakeholder engagement and grievance framework ensures that:

- Stakeholders remain actively engaged throughout the project lifecycle
- Concerns are identified early and addressed effectively
- Communication is transparent, structured, and accountable
- The project maintains a strong social licence to operate

7 ENVIRONMENTAL MONITORING & AUDITING

7.1 Monitoring Objectives and Key Performance Indicators (KPIs)

7.1.1 Monitoring Objectives

The environmental monitoring programme is designed to:

- Verify compliance with ESMP requirements and ECC conditions
- Assess the effectiveness of mitigation measures
- Detect early signs of environmental or social impact
- Provide data for decision-making and adaptive management
- Ensure transparency and accountability to regulators and stakeholders

7.1.2 Key Performance Indicators (KPIs)

KPIs are defined to enable quantifiable tracking of environmental and social performance.

Table 3: Core KPI Categories

Category	Indicator	Target / Standard
Marine Environment	Evidence of ecological disturbance	No significant adverse impacts
Biodiversity (Lichens)	Disturbance outside approved footprint	Zero tolerance
Water Quality	Compliance with defined parameters	Within acceptable limits
Waste Management	Waste segregation and disposal compliance	100% compliance
Air Quality	Dust levels during construction	Controlled / no complaints
Socio-Economic	Stakeholder complaints resolved	Within defined timelines
OHS	Lost Time Injury Frequency Rate (LTIFR)	Zero or minimal incidents

7.1.3 Performance Reporting

Monitoring results will be compiled into:

- Monthly internal reports
- Quarterly environmental reports
- Annual compliance summaries

7.2 Environmental Monitoring Schedule (Parameters, Locations, Frequency)

Monitoring will be undertaken across all project phases and environmental components.

7.2.1 ENVIRONMENTAL MONITORING MATRIX (EXPANDED & TECHNICAL)

Parameter	Location	Frequency	Phase	Method / Standard	Threshold / Trigger Level	Data Output	Responsibility
Marine Environment Monitoring							
Turbidity (NTU)	Near seawater intake	Quarterly	Operation	Portable turbidimeter (APHA Standard Methods)	> baseline ±20%	NTU values, trend analysis	Operator / Marine Specialist / ECO
Temperature (°C)	Intake zone	Quarterly	Operation	Multi-parameter probe	Δ > 2°C from baseline	Temperature profile	Operator
Salinity (PSU)	Intake zone	Quarterly	Operation	Salinity probe	Outside baseline range	Salinity trends	Operator
Marine ecological observations	Intake zone	Quarterly	Operation	Field surveys (visual + photographic records)	Any fish mortality or abnormal behaviour	Incident reports	ECO

Terrestrial Biodiversity (Lichens)

Parameter	Location	Frequency	Phase	Method	Threshold	Output	Responsibility
Lichen disturbance	Construction footprint & no-go zones	Weekly	Construction	Visual inspection + GPS verification	Any disturbance in no-go zones (ZERO tolerance)	Inspection reports, photos	ECO / Contractor
Vehicle track compliance	Access routes	Weekly	Construction	Site inspection	Any off-route movement	Incident logs	ECO

Water Quality Monitoring

Parameter	Location	Frequency	Phase	Method	Threshold	Output	Responsibility
pH	Process systems	Monthly	Operation	Probe (APHA)	Outside 6–9 (or site-specific)	Lab/field results	Operator

Turbidity	Storage/process systems	Monthly	Operation	Turbidimeter	Exceeds internal system limits	Water quality report	Operator
Oil & grease	Storage areas	Monthly	Operation	Lab analysis	Detectable presence	Compliance report	Operator
Chemical contaminants	Storage/process systems	Quarterly	Operation	Laboratory analysis	Above permissible levels	Lab certificates	Operator / ECO

Waste Management Monitoring

Parameter	Location	Frequency	Phase	Method	Threshold	Output	Responsibility
Waste segregation compliance	Site-wide	Weekly	Construction & Operation	Visual inspection checklist	Non-segregation observed	Inspection reports	Contractor / ECO
Hazardous waste storage	Designated areas	Weekly	All	Inspection	No bunding / improper storage	Compliance log	ECO
Waste disposal records	Site office	Monthly	All	Documentation review	Missing records	Audit report	Proponent

Air Quality Monitoring

Parameter	Location	Frequency	Phase	Method	Threshold	Output	Responsibility
Dust (PM10/visual)	Construction areas	Weekly	Construction	Visual + portable monitor	Visible plumes / complaints	Monitoring log	Contractor
Wind speed/direction	Site	Weekly	Construction	Anemometer	High wind triggering dust events	Site records	Contractor

Noise Monitoring

Parameter	Location	Frequency	Phase	Method	Threshold	Output	Responsibility
Noise levels (dB(A))	Site boundary	As required / complaints	Construction	Sound level meter (ISO standard)	> acceptable limits	Noise reports	Contractor / ECO

Socio-Economic / Stakeholder Monitoring

Parameter	Location	Frequency	Phase	Method	Threshold	Output	Responsibility
Stakeholder complaints	Community interface	Continuous	All	GRM system	Unresolved complaints >30 days	GRM reports	CLO / Proponent
Employment metrics	Project site	Quarterly	Construction & Operation	HR records	Targets not met	Employment report	Proponent
Access disruption reports	Coastal access routes	Monthly	Construction	Stakeholder feedback	Repeated complaints	Incident log	Proponent

All monitoring results must:

- Be compared against defined thresholds (Section 7.5)
- Trigger Corrective and Preventative Actions (CAPA) where exceedances occur
- Be recorded in:
    - Monitoring registers
    - Incident logs
    - CAPA tracking system

7.2.2 Monitoring Responsibilities

- **Contractors:** Routine monitoring during construction
- **ECO:** Oversight, verification, and auditing
- **Operator:** Operational monitoring and reporting

7.3 Compliance Auditing (Internal and External)

Auditing ensures that ESMP implementation is independently verified and continuously improved.

7.3.1 Internal Audits

- Conducted by:
  - Environmental Control Officer (ECO)
  - Project Environmental Manager
- Frequency:
  - Monthly (construction phase)
  - Quarterly (operation phase)

7.3.2 External Audits

- Conducted by:
  - Independent environmental auditors (if required)
  - Regulatory authorities
- Purpose:
  - Verify compliance
  - Assess ESMP effectiveness
  - Identify improvement areas

7.3.3 Audit Outputs

- Audit reports
- Non-compliance findings
- Corrective action recommendations

7.4 Corrective and Preventative Actions (CAPA)

A structured CAPA system will be implemented to address non-compliance and prevent recurrence.

7.4.1 Corrective Actions

Triggered when:

- Non-compliance is identified
- Environmental incidents occur
- Monitoring results exceed thresholds

Actions include:

- Immediate response and containment
- Root cause analysis
- Implementation of corrective measures

7.4.2 Preventative Actions

- Identification of potential risks before occurrence
- Adjustment of procedures and controls
- Continuous improvement measures

7.4.3 CAPA Tracking

All actions will be:

- Recorded in a CAPA register
- Assigned to responsible personnel
- Tracked until closure

7.5 Thresholds and Action Triggers

Defined thresholds ensure that monitoring results translate into actionable responses.

Table 4: Threshold Matrix

Parameter	Threshold	Action Trigger
Lichen disturbance	Any disturbance in no-go zones	Immediate stop-work
Water quality	Exceedance of limits	Investigate and adjust operations
Marine impact	Observable ecological disruption	Review intake operations
Waste management	Improper disposal	Immediate corrective action
Complaints	Repeated unresolved complaints	Escalation and intervention

7.5.1 Response Actions

- Immediate corrective measures
- Notification of ECO and management
- Escalation where required

7.6 Environmental and Social Risk Register

A Risk Register will be maintained to track and manage environmental and social risks.

Table 5: Risk Register Structure

Risk	Likelihood	Impact	Mitigation	Status
Marine disturbance	Medium	Medium	Intake controls	Active
Lichen damage	High	High	No-go zones	Controlled
Pollution event	Low	High	Spill prevention	Controlled
Community conflict	Medium	Medium	Engagement	Active

7.6.1 Risk Management

- Risks reviewed regularly
- Updated based on monitoring and audits
- Integrated into management decisions

7.7 Adaptive Management Framework

The project adopts an adaptive management approach to ensure responsiveness to changing conditions.

7.7.1 Adaptive Management Cycle

Figure 2: Adaptive Management Cycle (Courtesy, Erongo Consulting Group, 2026)

7.7.2 Key Principles

- Continuous learning from monitoring data
- Flexibility in management approaches
- Integration of stakeholder feedback
- Ongoing refinement of mitigation measures

7.7.3 Implementation

- Monitoring data informs decision-making
- Management measures updated where necessary
- Lessons learned incorporated into future operations

7.8 Summary

The monitoring and auditing framework ensures that:

- Environmental and social performance is measurable and verifiable
- Compliance is actively enforced
- Risks are identified and managed proactively
- The ESMP remains dynamic and responsive

8 CAPACITY BUILDING & TRAINING

8.1 Environmental Awareness and Induction Training

8.1.1 Purpose

Environmental awareness and induction training is a mandatory requirement to ensure that all personnel:

- Understand the environmental sensitivities of the project area
- Are aware of ESMP requirements and site-specific rules
- Can identify and prevent environmental risks and impacts
- Contribute to compliance and responsible behaviour on site

8.1.2 Applicability

Induction training applies to:

- All contractors and sub-contractors
- All project employees and operational staff
- Visitors entering operational or construction areas (where relevant)

No personnel will be permitted to commence work without completing environmental induction training.

8.1.3 Training Content

The induction programme will cover:

- Overview of the project and environmental context
- Key environmental sensitivities, including:
    - Lichen fields and protected areas
    - Marine and coastal systems
- ESMP requirements and site rules
- No-go zones and restricted areas
- Waste management procedures
- Pollution prevention measures
- Incident reporting procedures
- Health, safety, and environmental responsibilities

8.1.4 Delivery and Frequency

- Conducted prior to commencement of work
- Refresher training conducted:
    - Periodically (e.g., quarterly)
    - When significant changes occur

- Toolbox talks conducted regularly during construction

8.2 Specialized Technical Training (Spill Response, Biosecurity, etc.)

8.2.1 Purpose

Specialised training ensures that designated personnel are equipped with the technical skills required to manage high-risk activities, respond to incidents, and implement specific ESMP requirements.

8.2.2 Key Training Areas

Spill Prevention and Response

- Identification of spill risks
- Use of spill kits and containment equipment
- Emergency response procedures
- Reporting and documentation

Biosecurity Management

- Prevention of contamination and invasive species introduction
- Controlled handling of biological materials
- Hygiene and containment protocols

Waste Management

- Waste segregation and classification
- Handling of hazardous waste
- Storage and disposal procedures

Environmental Monitoring

- Sampling techniques (water, marine, etc.)
- Data recording and reporting
- Compliance verification

Occupational Health and Safety (OHS)

- Safe work practices
- Use of personal protective equipment (PPE)
- Incident response and reporting

8.2.3 Target Personnel

Specialised training will be provided to:

- Environmental officers and site supervisors
- Designated spill response teams
- Operational and maintenance staff
- Contractors involved in high-risk activities

8.2.4 Training Frequency

- Prior to undertaking relevant activities
- Refresher training annually or as required
- After incidents or identified performance gaps

8.3 Record Keeping and Training Attendance Registers

8.3.1 Purpose

Accurate record keeping ensures that all training activities are:

- Documented and verifiable
- Available for audit and compliance purposes
- Used to track personnel competency and coverage

8.3.2 Training Records

The following records will be maintained:

- Training attendance registers
- Training materials and content
- Dates and frequency of training sessions
- Names and roles of participants
- Trainer details

8.3.3 Training Register

A centralised Training Register will include:

- Personnel identification
- Training completed
- Dates of induction and refresher training
- Outstanding training requirements

8.3.4 Compliance and Monitoring

- The ECO will verify training records during inspections
- Non-compliance (e.g., untrained personnel) will trigger:
    - Immediate corrective action
    - Suspension of work where necessary

8.3.5 Continuous Improvement

Training programmes will be:

- Updated based on:
    - Monitoring results
    - Audit findings
    - Incident investigations
- Adapted to address:
    - Emerging risks
    - Changes in project activities

8.4 Summary

The capacity building and training framework ensures that:

- All personnel are competent and aware of environmental responsibilities
- High-risk activities are managed by trained and qualified individuals
- Training is documented, monitored, and continuously improved
- ESMP implementation is supported by practical knowledge and skills

9 EMERGENCY PREPAREDNESS AND RESPONSE

9.1 Emergency Identification (Spills, Fires, Equipment Failure)

9.1.1 Purpose

This section establishes a structured framework to:

- Identify potential emergency scenarios
- Ensure preparedness for rapid response
- Minimise environmental, social, and operational impacts
- Protect human health, safety, and ecological systems

9.1.2 Potential Emergency Scenarios

Based on the project's activities and risk profile, the following emergency scenarios have been identified:

a) Chemical and Fuel Spills

- Leakage from storage tanks or pipelines
- Accidental spillage during transport or handling
- Equipment failure resulting in release of hazardous substances

Potential Impacts:

- Soil and groundwater contamination
- Marine pollution (if uncontrolled)
- Health and safety risks

b) Fire and Explosion Risks

- Fuel storage and handling
- Electrical system failures
- Equipment malfunction

Potential Impacts:

- Injury or loss of life
- Infrastructure damage
- Air pollution

c) Equipment Failure and Operational Incidents

- Failure of seawater intake or pumping systems
- Structural failures in cultivation or processing systems
- Power supply interruptions

Potential Impacts:

- Operational disruption
- Environmental contamination
- Safety risks

d) Environmental Incidents

- Accidental release of pollutants
- Uncontrolled waste disposal
- Breach of containment systems

e) Natural and External Events

- Extreme weather conditions
- Coastal events affecting infrastructure
- External hazards (e.g., transport accidents)

9.2 Response Procedures and Command Structure

9.2.1 Emergency Response Principles

All emergency responses will be guided by the following principles:

- Immediate containment and control of the incident
- Protection of human health and safety
- Minimisation of environmental damage
- Clear communication and coordination
- Rapid reporting and documentation

9.2.2 Emergency Response Process

The standard emergency response process includes:

1. **Incident Detection and Reporting**
    - Immediate identification and notification of incident
2. **Initial Response and Containment**
    - Activation of response procedures
    - Deployment of spill kits or firefighting equipment
3. **Assessment and Escalation**
    - Evaluation of severity

    - Escalation to management and authorities where required
4. **Implementation of Control Measures**
    - Containment, clean-up, and stabilisation
5. **Recovery and Restoration**
    - Restoration of affected areas
    - Safe resumption of operations
6. **Incident Reporting and Review**
    - Documentation
    - Root cause analysis
    - Integration into CAPA system

9.2.3 Command Structure

A clear chain of command will be established for emergency situations:

Table 6: Roles and Responsibilities in Incident Response and Environmental Management

Role	Responsibility
Site Supervisor	Initial incident response and reporting
Environmental Control Officer (ECO)	Environmental oversight and compliance
Project Manager	Overall coordination and decision-making
Emergency Response Team	Implementation of response actions
Regulatory Authorities	Oversight and external coordination

9.2.4 Roles and Responsibilities in Emergencies

- **All Personnel:**
    - Report incidents immediately
    - Follow emergency procedures
- **Site Supervisor:**
    - Coordinate immediate response
    - Ensure safety of personnel
- **ECO:**
    - Assess environmental impact
    - Ensure compliance with reporting requirements
- **Project Management:**
    - Authorise escalation and external communication
    - Ensure resources are available

9.2.5 Communication During Emergencies

- Immediate internal communication via site channels
- Notification of:
    - ECO
    - Project management
    - Relevant authorities (if required)
- Stakeholder communication where necessary

9.3 Emergency Contact Directory and Equipment Maintenance

9.3.1 Emergency Contact Directory

A comprehensive and updated emergency contact list will be maintained, including:

- Project management contacts
- Environmental Control Officer
- Emergency services (fire, medical, police)
- Regulatory authorities
- Key contractors and response teams

This directory will be:

- Displayed prominently on-site
- Included in site induction materials
- Updated regularly

9.3.2 Emergency Equipment

The following equipment will be available and maintained:

- Spill kits (appropriate to risk level)
- Fire extinguishers and firefighting equipment
- First aid kits
- Personal protective equipment (PPE)
- Communication devices

9.3.3 Equipment Maintenance

- All emergency equipment will be:
    - Regularly inspected
    - Maintained in operational condition
    - Replaced or replenished as needed
- Inspection frequency:
    - Monthly (minimum)
    - After any incident or use

9.3.4 Training and Drills

- Emergency response training will be conducted for relevant personnel
- Periodic emergency drills will be carried out to test preparedness
- Lessons learned from drills will be integrated into procedures

9.4 Incident Reporting and Documentation

All incidents will be:

- Recorded in an Incident Register
- Investigated to determine root cause
- Linked to the CAPA system (Section 7.4)
- Reported to authorities where required

9.5 Summary

The emergency preparedness and response framework ensures that:

- Potential emergencies are identified and planned for
- Response procedures are clear, structured, and effective
- Roles and responsibilities are well defined
- Equipment and resources are available and maintained
- Incidents are managed, reported, and learned from

10 DECOMMISSIONING AND REHABILITATION

10.1 Objectives for Closure

10.1.1 Purpose

The purpose of decommissioning and rehabilitation is to ensure that, at the end of the project lifecycle, the site is:

- Environmentally stable and safe
- Free from pollution and contamination
- Restored, as far as practicable, to its pre-project condition or an acceptable alternative state
- No longer posing risks to surrounding ecosystems, communities, or stakeholders

10.1.2 Closure Objectives

The primary objectives of closure are to:

- Safely decommission and remove infrastructure
- Prevent residual environmental impacts
- Restore land functionality and ecological integrity, where feasible
- Ensure compliance with regulatory requirements and ECC conditions
- Address stakeholder expectations and concerns

10.1.3 Closure Planning Principles

Closure planning will be guided by the following principles:

- **Early planning:** Closure considerations integrated during design and operation
- **Minimisation of long-term impacts:** Avoid leaving permanent environmental liabilities
- **Progressive rehabilitation:** Where feasible, rehabilitation undertaken during the project lifecycle
- **Compliance and accountability:** Alignment with legal and regulatory requirements
- **Adaptive management:** Incorporation of monitoring outcomes into closure strategies

10.2 Infrastructure Removal and Site Restoration

10.2.1 Decommissioning Activities

At the end of operations, the following activities will be undertaken:

- Removal of:
    - Processing and refining infrastructure
    - Storage facilities and tanks

    - Pipelines and seawater abstraction systems
    - Electrical and utility systems
    - Temporary construction structures
- Safe dismantling and disposal of materials, including:
    - Recycling where possible
    - Disposal at licensed facilities

10.2.2 Site Clean-Up

- Removal of all waste materials, including hazardous substances
- Decontamination of areas affected by operational activities
- Verification that no residual pollution remains

10.2.3 Land Rehabilitation

Given the arid desert environment and ecological sensitivity of the site, rehabilitation will focus on:

- Stabilisation of disturbed areas
- Prevention of erosion and further degradation
- Restoration of natural landforms where feasible
- Protection of surrounding undisturbed ecosystems

10.2.4 Biodiversity Considerations

- Avoid further disturbance to lichen fields and sensitive habitats
- Allow for natural regeneration processes, recognising slow recovery rates in desert ecosystems
- Monitor ecological recovery over time

10.2.5 Marine and Coastal Restoration

- Removal of seawater intake structures
- Restoration of coastal interface areas
- Verification that no residual impacts remain on marine systems

10.3 Post-Closure Monitoring Requirements

10.3.1 Purpose

Post-closure monitoring is required to ensure that:

- Rehabilitation measures are effective
- Environmental conditions remain stable
- No delayed or residual impacts occur

10.3.2 Monitoring Parameters

Monitoring will include:

- Soil and land stability
- Residual contamination (if applicable)
- Biodiversity recovery (including lichen systems)
- Marine conditions (where relevant)

10.3.3 Monitoring Duration

- Monitoring will continue for a defined period following closure, typically:
  - 1–3 years minimum, depending on site conditions
- Extended monitoring may be required if:
  - Recovery is slow
  - Residual impacts are detected

10.3.4 Monitoring Responsibility

- The Proponent remains responsible for post-closure monitoring
- The ECO or appointed specialist will oversee monitoring activities
- Reports will be submitted to regulatory authorities as required

10.3.5 Closure Verification and Sign-Off

Closure will be considered complete only when:

- All infrastructure has been removed
- Rehabilitation objectives have been met
- Monitoring confirms environmental stability
- Regulatory authorities formally approve closure and sign-off

10.4 Summary

The decommissioning and rehabilitation framework ensures that:

- The project does not leave long-term environmental liabilities
- The site is restored to a safe and stable condition
- Environmental recovery is monitored and verified
- Closure is conducted in a responsible, transparent, and compliant manner

11 ESMP BUDGET AND IMPLEMENTATION SCHEDULE

11.1 Financial Provisions for Mitigation and Monitoring

11.1.1 Purpose

The successful implementation of the ESMP requires adequate financial resources to ensure that all mitigation, monitoring, and management measures are:

- Properly implemented
- Sustained throughout the project lifecycle
- Responsive to environmental and social risks

The allocation of financial resources demonstrates the proponent's commitment to environmental compliance and responsible project development.

11.1.2 Budget Allocation Principles

Financial provisions for the ESMP will be guided by the following principles:

- **Integration into project costs**
  ESMP-related costs are incorporated into overall project capital and operational budgets
- **Lifecycle coverage**
  Budget allocations account for all phases:
  - Pre-construction
  - Construction
  - Operation
  - Decommissioning
- **Risk-based allocation**
  Higher-risk areas (e.g., marine systems, biodiversity protection) receive proportionally greater resources
- **Flexibility and contingency**
  Provision is made for unforeseen environmental or social issues

11.1.3 Key Cost Categories

The ESMP budget includes, but is not limited to, the following components:

a) Environmental Monitoring

- Marine monitoring programmes
- Water quality testing
- Biodiversity (lichen) monitoring
- Air and noise monitoring

b) Environmental Management and Compliance

- Environmental Control Officer (ECO) services
- Environmental audits (internal and external)
- Compliance reporting and documentation

c) Mitigation Measures

- Installation of environmental controls (e.g., intake systems, containment measures)
- Dust suppression and erosion control
- Waste management systems
- Pollution prevention infrastructure

d) Training and Capacity Building

- Environmental induction training
- Specialist technical training
- Emergency response training

e) Stakeholder Engagement and GRM

- Public consultation activities
- Community liaison functions
- Grievance management systems

f) Emergency Preparedness

- Spill response equipment
- Fire safety systems
- Emergency drills and training

g) Decommissioning and Rehabilitation

- Infrastructure removal
- Site rehabilitation measures
- Post-closure monitoring

Table 7: Indicative Budget Structure

Cost Category	Description	Phase
Monitoring	Environmental data collection	All phases
Compliance	ECO, audits, reporting	All phases
Mitigation	Environmental controls	Construction & Operation
Training	Capacity building	All phases
Stakeholder Engagement	GRM, consultations	All phases
Emergency Preparedness	Equipment and training	Construction & Operation
Rehabilitation	Closure and restoration	Decommissioning

11.1.4 Financial Responsibility

- The **Proponent** is fully responsible for financing ESMP implementation
- Budget allocation will be integrated into:
    - Project capital expenditure (CAPEX)
    - Operational expenditure (OPEX)

11.1.5 Financial Assurance

Where required, financial provisions may include:

- Dedicated environmental management budgets
- Contingency funds for environmental incidents
- Provision for closure and rehabilitation costs

11.2 Implementation Timeline Linked to Project Milestones

11.2.1 Purpose

The implementation schedule ensures that ESMP measures are:

- Applied at the correct stage of the project lifecycle
- Integrated into project planning and execution
- Monitored and updated as the project progresses

11.2.2 Phase-Based Implementation Timeline

Pre-Construction Phase

Key Activities:

- Final ESMP approval
- Baseline environmental studies
- Stakeholder engagement
- Contractor appointment and training

ESMP Focus:

- Planning and design integration
- Establishment of management systems
- Environmental awareness

Construction Phase

Key Activities:

- Site clearing and infrastructure development
- Installation of systems

ESMP Focus:

- Implementation of mitigation measures
- Active environmental monitoring
- Enforcement of no-go zones
- Waste and pollution control

Operational Phase

Key Activities:

- Algae cultivation and processing
- Routine operations

ESMP Focus:

- Long-term monitoring (marine, water, biodiversity)
- Maintenance of environmental controls
- Stakeholder engagement
- Adaptive management

Decommissioning Phase

Key Activities:

- Infrastructure removal
- Site rehabilitation

ESMP Focus:

- Environmental restoration
- Post-closure monitoring
- Regulatory sign-off

Table 8: Implementation Schedule Table

Phase	Key ESMP Activities	Timing
Pre-construction	Baseline studies, planning, training	Before construction
Construction	Mitigation implementation, monitoring	During construction
Operation	Monitoring, reporting, engagement	Ongoing
Decommissioning	Rehabilitation, closure monitoring	End of project

11.2.3 Integration with Project Management

The ESMP implementation schedule will be:

- Integrated into the overall project execution plan
- Aligned with construction and operational timelines
- Reviewed regularly to ensure effectiveness

11.2.4 Monitoring of Implementation

- Implementation progress will be tracked through:
  - Monitoring reports
  - Audit findings
  - Performance reviews
- Adjustments will be made through:
  - Adaptive management (Section 7.7)
  - CAPA system (Section 7.4)

11.2.5 Summary

The ESMP budget and implementation schedule ensure that:

- Environmental and social commitments are financially supported
- Measures are implemented at the appropriate project stages
- The ESMP is practical, realistic, and enforceable
- The project demonstrates credible commitment to sustainability and compliance

12 CONCLUSION

The Environmental and Social Management Plan (ESMP) provides a comprehensive, structured, and enforceable framework for managing the environmental and social aspects of the proposed algae farming and biorefinery project at Henties Bay.

The ESMP translates the findings of the Environmental Impact Assessment (EIA) into practical, implementable measures, ensuring that all identified impacts are:

- Avoided, minimised, or mitigated to acceptable levels
- Monitored and managed throughout the project lifecycle
- Linked to clear responsibilities, timelines, and performance indicators

12.1 Key Outcomes

The ESMP demonstrates that:

- Environmental and social risks associated with the project are well understood and manageable
- Robust mitigation measures and management plans have been developed and integrated
- Monitoring, auditing, and reporting systems are in place to ensure continuous compliance and performance improvement
- Stakeholder concerns have been identified, addressed, and operationalised through engagement and grievance mechanisms

12.2 Implementation Commitment

The Proponent commits to:

- Full implementation of the ESMP across all project phases
- Compliance with all applicable legislation and Environmental Clearance Certificate (ECC) conditions
- Allocation of adequate financial, technical, and human resources
- Ongoing engagement with stakeholders and regulatory authorities
- Continuous improvement through adaptive management and monitoring

12.3 Environmental and Social Responsibility

The project is positioned to:

- Support sustainable development objectives, including renewable energy and blue economy initiatives
- Contribute to economic growth, employment, and capacity development
- Operate in a manner that is environmentally responsible and socially responsive

12.4Final Statement

Based on the findings of the EIA and the commitments outlined in this ESMP:

The proposed development is considered environmentally and socially acceptable, provided that all mitigation measures, monitoring requirements, and management commitments contained in this ESMP are fully implemented and maintained.

13 REFERENCES

13.1 NAMIBIAN LEGAL AND POLICY FRAMEWORK

Republic of Namibia. (2007).
Environmental Management Act (Act No. 7 of 2007). Windhoek: Government of Namibia.

Republic of Namibia. (2012).
Environmental Impact Assessment Regulations (Government Notice No. 30).

Republic of Namibia. (2000).
Marine Resources Act (Act No. 27 of 2000).

Republic of Namibia. (2013).
Water Resources Management Act (Act No. 11 of 2013).

Republic of Namibia. (2012).
National Policy on Climate Change for Namibia.

Republic of Namibia. (2017).
Harambee Prosperity Plan / National Development Plans (NDPs).

Ministry of Environment, Forestry and Tourism (MEFT). (2020).
Guidelines for Environmental Impact Assessment in Namibia.

13.2 INTERNATIONAL STANDARDS AND GUIDELINES

International Finance Corporation (IFC). (2012).
IFC Performance Standards on Environmental and Social Sustainability.

World Bank Group. (2007, updated).
Environmental, Health, and Safety (EHS) Guidelines – General and Sector-Specific.

World Bank. (2017).
Environmental and Social Framework (ESF).

United Nations Environment Programme (UNEP). (2011).
Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach.

International Organization for Standardization (ISO). (2015).
ISO 14001: Environmental Management Systems – Requirements with Guidance for Use.

ISO (2018).
ISO 45001: Occupational Health and Safety Management Systems.

13.3 WATER QUALITY, SAMPLING, AND ANALYTICAL METHODS

American Public Health Association (APHA). (2017).
Standard Methods for the Examination of Water and Wastewater (23rd Edition).

World Health Organization (WHO). (2017).
Guidelines for Drinking-water Quality (4th Edition).

ISO (2009–2020 series).
Water Quality Standards (ISO 5667 – Sampling; ISO 10523 – pH; ISO 11923 – Suspended Solids).

13.4 MARINE AND COASTAL ENVIRONMENT

FAO. (2009).
Fisheries Management Guidelines.

UNESCO. (2009).
Marine Spatial Planning: A Step-by-Step Approach.

World Bank. (2010).
Guidelines for Coastal Zone Management.

GESAMP (IMO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP).
Reports on Marine Environmental Protection and Pollution Control.

13.5 BIODIVERSITY AND TERRESTRIAL ECOSYSTEMS

International Union for Conservation of Nature (IUCN). (2016).
Guidelines for Applying Protected Area Management Categories.

Convention on Biological Diversity (CBD). (2010).
Strategic Plan for Biodiversity 2011–2020.

SAEON / regional literature (Southern Africa).
Arid ecosystem and lichen field sensitivity studies (relevant to Namib coastal systems).

13.6 AIR QUALITY AND NOISE

World Health Organization (WHO). (2021).
Global Air Quality Guidelines.

IFC / World Bank.
EHS Guidelines for Air Emissions and Ambient Air Quality.

ISO (1996 series).
Acoustics – Description, Measurement and Assessment of Environmental Noise.

13.7 SOCIAL, STAKEHOLDER ENGAGEMENT, AND GRIEVANCE MECHANISMS

IFC. (2007).
Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets.

World Bank. (2018).
Environmental and Social Standard 10 (ESS10): Stakeholder Engagement and Information Disclosure.

OECD. (2011).
Guidelines for Multinational Enterprises.

13.8 HEALTH, SAFETY, AND INCIDENT MANAGEMENT

ILO (International Labour Organization).
Guidelines on Occupational Safety and Health Management Systems.

ISO (2018).
ISO 45001: Occupational Health and Safety.

IFC / World Bank.
General EHS Guidelines – Occupational Health and Safety Section.

13.9 CLIMATE CHANGE AND SUSTAINABILITY

IPCC. (2021).
Sixth Assessment Report (AR6).

United Nations. (2015).
Sustainable Development Goals (SDGs).

Republic of Namibia.
Nationally Determined Contributions (NDCs).

14 APPENDICES

APPENDIX A: DETAILED MONITORING DATA SHEETS (TECHNICAL)

B1. General Protocols (All Monitoring Activities)

Standards & Methods

- Sampling/measurement methods shall follow recognised standards (e.g., APHA Standard Methods for water, ISO/IEC methods, WHO/IFC EHS guidance where applicable).
- All instruments must be calibrated to manufacturer specifications; calibration records attached to each dataset.

Chain-of-Custody (CoC)

- Each sample assigned a unique Sample ID.
- CoC form accompanies samples from collection to analysis, recording collector, transfer times, laboratory receipt, and condition.

QA/QC Requirements

- Field duplicates: ≥10% of samples
- Field blanks (where applicable): ≥5%
- Equipment blanks (for chemical sampling): as required
- Data validation: outliers flagged; corrective re-sampling triggered if QA/QC fails

Data Integrity

- Use indelible ink (paper) or locked digital forms
- Corrections: single line-through, initialled, dated
- GPS coordinates in WGS84 (decimal degrees)

Linkage

- Each record references: Impact ID (Ch.8), Issue ID (Ch.9), ESMP Measure ID (Sec.5), CAPA ID (Sec.7.4)

B2. Marine Environment Monitoring Sheet (MM-01)

Metadata

- Date/Time (UTC):
- Inspector / Marine Specialist:
- Weather (Beaufort), Wind (m/s, direction), Tide (state/height):

- Location Name & GPS (WGS84):
- Station ID:
- Activity Phase (Construction/Operation):

Field Measurements (In-situ)

Parameter	Instrument	Result	Unit	QA/QC	Threshold	Compliance
Turbidity	Portable turbidimeter		NTU	Cal OK / Drift	Project baseline ±X%	Y/N
Temperature	Multi-probe		°C	Cal OK	Δ ≤ 2°C from baseline	Y/N
Salinity	Refractometer/Probe		PSU	Cal OK	Site-specific range	Y/N
DO (Dissolved Oxygen)	Probe		mg/L	Cal OK	≥ site baseline – 20%	Y/N

Biological/Visual Observations

Indicator	Observation	Severity (Low/Med/High)	Compliance
Plankton density (qualitative)			
Fish/invertebrate presence			
Signs of stress/mortality			
Sheen/odour/discharge evidence			
Fishing access maintained			

Intake Performance (if applicable)

- Intake screen condition (clean/blocked):
- Intake velocity (m/s):
- Entrainment/impingement evidence:

Non-Compliance / Incident

Description	Impact ID	Immediate Action	CAPA ID	Responsible	Due Date

Attachments: Photos (geo-tagged), CoC forms, calibration logs
Sign-off: Inspector / ECO / Date

B3. Terrestrial Biodiversity (Lichen) Monitoring Sheet (TB-01)

Metadata

- Date/Time:
- ECO / Botanist:
- Zone ID (No-Go/Buffer/Work Area):

- GPS Track Logged (Y/N):

Compliance Checklist

Parameter	Status	Evidence/Notes	Threshold	Compliance
No-go demarcation intact			100% intact	Y/N
Vehicle tracks within corridors			0 excursions	Y/N
Lichen disturbance observed			0 outside footprint	Y/N
Signage visibility			≥95% visible	Y/N

Disturbance Quantification

- Area disturbed (m²):
- Distance from boundary (m):
- Photo references:

Corrective Actions

Issue	Impact ID	Action	CAPA ID	Responsible	Deadline

Sign-off: ECO / Contractor Rep / Date

B4. Water Quality Monitoring Sheet (WQ-01)

Metadata

- Date/Time:
- Sampling Location & GPS:
- Sample ID / Bottle IDs:
- Sampler:
- Preservation (e.g., HNO_3, ice ≤4°C):
- Lab Name:

Field Measurements

Parameter	Method	Result	Unit	QA/QC	Threshold	Compliance
pH	Probe		SU	Cal OK	6–9 (or site-specific)	Y/N
Temperature	Probe		°C	Cal OK	Site-specific	Y/N
EC/Salinity	Probe		µS/cm or PSU	Cal OK	Site-specific	Y/N
Turbidity	Meter		NTU	Cal OK	Site-specific	Y/N

Laboratory Analyses (attach CoC)

Parameter	Method (APHA/ISO)	Result	Unit	Detection Limit	Standard	Compliance
TSS			mg/L			
Oil & Grease			mg/L			

Nutrients (NO_3, PO_4)			mg/L			
Metals (if applicable)			µg/L			

Non-Compliance / CAPA

Parameter	Exceedance	Action	CAPA ID	Responsible	Due

Sign-off: Sampler / ECO / Date

B5. Waste Management Monitoring Sheet (WM-01)

Metadata

- Date/Area/Inspector:

Operational Controls

Parameter	Requirement	Status	Evidence	Compliance
Segregation (general/hazardous/recyclable)	100%			Y/N
Labelling (hazard symbols)	All containers			Y/N
Bunding (hazardous)	≥110% capacity			Y/N
Storage time limits	≤ site limit			Y/N
Licensed disposal	Verified			Y/N

Waste Inventory

Stream Quantity Unit Storage Location Disposal Method Manifest No.

Non-Compliance / CAPA

Issue Impact ID Action CAPA ID Responsible Deadline

B6. Air Quality & Dust Monitoring Sheet (AQ-01)

Metadata

- Date/Location/GPS/Weather (wind speed & direction):

Measurements

Parameter	Method	Result	Unit	Threshold	Compliance
PM_{10}	Portable monitor		µg/m³	Site limit	Y/N
$PM_{2.5}$	Portable monitor		µg/m³	Site limit	Y/N
Visible dust (qualitative)	Observation		-	No visible plumes	Y/N

Controls

Control	Status	Remarks
Water spraying		
Speed limits enforced		
Stockpile management		

Complaints Log (if any)

- Reference to GRM ID:

B7. Noise Monitoring Sheet (NO-01)

Metadata

- Date/Time/Location/GPS/Weather:
- Instrument (Class 1/2), Calibration Check (pre/post):

Measurements

Metric	Result	Unit	Standard/Limit	Compliance
LAeq (15 min)		dB(A)	Site limit	Y/N
Lmax		dB(A)	Site limit	Y/N

Notes

- Dominant source(s):
- Receptor type (residential/industrial):

CAPA (if exceedance)

Action	Responsible	Due

B8. Socio-Economic / Stakeholder Monitoring Sheet (SE-01)

Metadata

- Date/Stakeholder/Location/Engagement Type:

Engagement Record

Issue ID Topic Concern Action Agreed Status Due

KPIs

- Local employment (%):
- Training delivered (# persons):
- GRM cases open/closed:

B9. Incident Reporting Form (IR-01)

Metadata

- Incident ID / Date / Time / Location (GPS):
- Reported by / Contractor / Activity:

Classification

- **Type**: Spill / Fire / Equipment Failure / Biodiversity / Community
- **Severity:** Minor / Moderate / Major
- **Impact ID (Ch.8):**

Description (factual)

Immediate Response

- Containment actions:
- Personnel safety actions:

Environmental Impact Assessment (initial)

- Media affected (soil/water/marine/air):
- Area affected (m^2):

Root Cause (preliminary)

Corrective & Preventative Actions

Action CAPA ID Responsible Due Status

Regulatory Notification

- Required (Y/N) / Authority / Date/Time:

Closure

- Verified by ECO / Date:

B10. CAPA Tracking Sheet (CA-01)

CAPA ID	Source (Audit /Incident/ Monitoring)	Issue	Root Cause	Action	Owner	Start	Due	Status	Verification

B11. Inspection & Audit Sign-Off (QA-01)

Record Type ID Inspector Signature Date ECO Verification Date

B12. Thresholds & Trigger Reference (Link to Sec. 7.5)

Parameter	Threshold	Trigger Action	Escalation
Lichen disturbance	Any in no-go	Stop-work	Project Manager / Regulator
Water quality	Exceedance vs standard	Investigate + adjust ops	ECO → Authority (if significant)
Marine impact	Observable distress	Review intake ops	ECO / Specialist
Waste	Improper handling	Immediate correction	Contractor sanctions
Noise	Exceedance	Modify schedule/controls	ECO

B13. Data Management & Archiving

- All records digitised within 48 hours
- Stored in central ESMP database with version control
- Retention: ≥5 years or per ECC condition
- Accessibility: available for audit and regulatory review on request

APPENDIX B: GRIEVANCE LOG TEMPLATE (TECHNICAL & AUDIT-READY)

C1. Purpose and Scope

This Grievance Log Template provides a formalised system for recording, tracking, investigating, and resolving stakeholder grievances associated with the project.

It ensures that all grievances are:

- Systematically documented and traceable
- Addressed within defined timelines
- Linked to ESMP mitigation measures and CAPA processes
- Auditable by regulators and external reviewers

This template applies across all project phases and supports continuous stakeholder engagement and accountability.

C2. Grievance Classification System

Each grievance must be classified to enable **trend analysis, prioritisation, and reporting**.

Code	Category	Description / Examples
ENV	Environmental	Marine impacts, pollution, biodiversity disturbance
SOC	Social	Community concerns, disturbances, expectations
ACC	Access	Coastal access, road closures, restrictions
EMP	Employment	Recruitment, labour-related concerns
HSE	Health & Safety	Safety risks, unsafe practices
INF	Infrastructure	Roads, utilities, site impacts
GEN	General	Other issues not categorised

C3. Grievance Log Register (Master Tracking Table)

Field	Details
Grievance ID	Unique identifier (e.g., GRM-2026-001)
Date Received	Date complaint was lodged
Time Received	Time of submission
Received By	Name and designation
Stakeholder Name	Individual / Organisation
Contact Details	Phone / Email
Stakeholder Type	Community / Fisher / Authority / NGO / Business
Location (GPS if applicable)	Area affected
Category Code	ENV / SOC / etc.
Issue ID (Chapter 9)	Link to stakeholder issue register
Description of Grievance	Detailed description

Severity Level	Low / Medium / High
Acknowledgement Date	Date acknowledged
Assigned To	Responsible person/unit
Investigation Required	Yes / No
Investigation Findings	Summary of investigation
Root Cause	Identified cause of issue
Action Taken	Corrective / mitigation actions
CAPA ID	Link to CAPA register (Section 7.4)
Status	Open / In Progress / Closed
Date Resolved	Date issue resolved
Response Provided	Summary of response to stakeholder
Stakeholder Feedback	Satisfied / Not Satisfied
Escalation Required	Yes / No
Escalation Details	Internal / regulatory escalation
Closure Verified By	ECO / Project Manager
Closure Date	Final closure date

C4. Grievance Intake Form (Field-Level Submission Form)

Grievance ID:
Date:
Time:
Received By:

Stakeholder Information

- Name:
- Organisation (if applicable):
- Contact Details:
- Stakeholder Type:

Grievance Details

- Location of Issue (include GPS if available):
- Category:
- Description of Concern:
- Date of Occurrence (if different from reporting date):
- Supporting Evidence (photos, documents):

Initial Assessment (Completed by Project Team)

- Severity Level: Low / Medium / High
- Immediate Action Required: Yes / No
- Assigned To:

C5. Grievance Processing Workflow

Each grievance must follow a **standardised workflow**:

1. **Receipt and Registration**
    - Assign unique ID
    - Record in Grievance Log
2. **Acknowledgement**
    - Within **3–5 working days**
3. **Screening and Classification**
    - Categorise and assess severity
4. **Investigation**
    - Conduct site inspection or consultation
    - Identify root cause
5. **Action and Resolution**
    - Implement corrective measures
    - Link to CAPA system where applicable
6. **Response to Stakeholder**
    - Provide feedback on actions taken
7. **Closure and Verification**
    - Confirm resolution
    - Obtain stakeholder feedback where possible

C6. Resolution Timeframes

Severity Level	Response Timeline
Low	≤ 14 working days
Medium	≤ 30 working days
High	Immediate action + escalation

Complex cases may require extended timelines, with stakeholder notification.

C7. Escalation Protocol

Grievances shall be escalated when:

- Not resolved within defined timelines
- Stakeholder is dissatisfied with outcome
- Issue poses significant environmental or social risk

Escalation levels:

1. Project Management
2. Senior Management
3. Regulatory Authorities (if required)

C8. Data Management and Reporting

- All grievances must be recorded in a centralised database
- Monthly and quarterly summaries must include:
    - Number of grievances received
    - Categories and trends
    - Resolution rates
    - Outstanding issues
- Data must be:
    - Retained for audit purposes
    - Available to regulatory authorities upon request

C9. Linkages to ESMP Systems

The Grievance Log is directly linked to:

- **Chapter 9:** Stakeholder Issues (Issue IDs)
- **Section 5:** Mitigation Measures
- **Section 7.4:** CAPA System
- **Section 7.6:** Risk Register

This ensures that grievances are not isolated events but are integrated into project management and continuous improvement processes.

APPENDIX C: INCIDENT REPORT FORMS (TECHNICAL & AUDIT-READY)

D1. Purpose and Scope

This appendix provides a structured system for:

- Recording environmental and social incidents
- Investigating root causes
- Implementing corrective and preventative actions (CAPA)
- Ensuring regulatory compliance and audit traceability

It applies to all incidents occurring during:

- Pre-construction
- Construction
- Operation
- Decommissioning

D2. Incident Classification System

All incidents must be categorised to support risk assessment and response prioritisation.

Code	Incident Type	Examples
ENV	Environmental	Spill, pollution, biodiversity impact
HSE	Health & Safety	Injury, unsafe conditions
MAR	Marine	Marine disturbance, intake issues
BIO	Biodiversity	Lichen damage, habitat disturbance
SOC	Social	Community complaints, access issues
OPR	Operational	Equipment failure, system breakdown

D3. Incident Severity Classification

Level	Description
Minor	No significant environmental or safety impact
Moderate	Localised impact, manageable with corrective action
Major	Significant impact requiring escalation and reporting

D4. Incident Reporting Form (IRF-01)

Section A: Basic Information

Field	Details
Incident ID	Unique reference (e.g., INC-2026-001)

Date of Incident	
Time of Incident	
Date Reported	
Reported By	Name and role
Contractor / Department	
Location (GPS if applicable)	
Project Phase	Pre-construction / Construction / Operation / Decommissioning

Section B: Incident Classification

Field	Details
Incident Type	ENV / HSE / MAR / BIO / SOC / OPR
Severity Level	Minor / Moderate / Major
Related Impact ID (Ch.8)	
Related Issue ID (Ch.9)	

Section C: Incident Description

Provide a **clear, factual, and objective description**:

- What happened
- When and where it occurred
- Activities taking place at the time
- Equipment or materials involved

Section D: Immediate Response Actions

Field	Details
Initial Response Taken	
Containment Measures Implemented	
Personnel Safety Actions	
Emergency Services Involved	Yes / No
Environmental Impact (Initial)	

Section E: Environmental and Social Impact Assessment

Impact Area	Description
Soil / Land	
Water / Marine	
Air	
Biodiversity	
Community	

D5. Root Cause Analysis (RCA) Form (IRF-02)

D5.1 Investigation Details

Field	Details
Investigator(s)	
Date of Investigation	
Method Used	5 Whys / Fishbone / Other

D5.2 Root Cause Identification

Category	Findings
Human Factors	
Equipment / Technical	
Process / Procedure	
Environmental Conditions	
Management / System	

D5.3 Root Cause Statement

Provide a concise statement identifying the primary cause(s) of the incident.

D6. Corrective and Preventative Actions (CAPA) Form (IRF-03)

Action ID	Type (Corrective /Preventative)	Description	Responsible	Deadline	Status

D6.1 CAPA Linkages

- Linked to CAPA Register (Section 7.4)
- Linked to Risk Register (Section 7.6)

D7. Incident Closure and Verification (IRF-04)

D7.1 Closure Criteria

An incident may only be closed when:

- All corrective actions have been implemented
- Environmental impacts have been addressed
- No further risk remains
- Monitoring confirms stability

D7.2 Closure Sign-Off

Field	Details
ECO Verification	Name & Signature
Project Manager Approval	Name & Signature
Date of Closure	

D8. Regulatory Notification and Reporting

D8.1 Notification Requirements

Incidents must be reported to relevant authorities when:

- Significant environmental impact occurs
- ECC conditions are breached
- Required by law

D8.2 Reporting Timeline

Severity	Reporting Requirement
Minor	Internal reporting only
Moderate	Report within 24–72 hours
Major	Immediate notification

D9. Incident Register (Summary Table)

Incident ID	Date	Type	Severity	Status	CAPA ID

D10. Data Management and Record Keeping

- All incident records must be:
  - Digitally stored in a central database
  - Linked to monitoring and CAPA systems
  - Retained for a minimum of 5 years or as per ECC conditions
- Records must be available for:
  - Internal audits
  - External audits
  - Regulatory inspections

D11. Summary

This Incident Reporting System ensures that:

- All incidents are systematically recorded and investigated
- Root causes are identified and addressed

- Corrective actions are implemented and tracked
- Compliance with regulatory requirements is maintained
- Lessons learned are integrated into project management