

**IMPLEMENTATION OF THE EMP_r FOR THE PROPOSED FRESHWATER
AQUACULTURE AND HORTICULTURE PROJECTS AT OMayANGA VILLAGE,
OSHANA REGION, NAMIBIA**

ENVORONMENTAL MANAGEMENT PLAN



**PREPARED FOR:
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PROJECT DESCRIPTION

*Proposed Freshwater Aquaculture and Horticulture Farming Activities
Omayanga Village, Oshana Region
Application No.: 240411003198*

APPLICANT

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1. Introduction

The Environmental Management Plan (EMP) includes the proposed mitigation, monitoring, and institutional measures to be taken during the various phases of the project life in order to prevent, minimize to acceptable levels, or eliminate adverse environmental and social impacts. EMP for freshwater aquaculture and horticulture developments is aimed at providing a logical framework during all phases of the project lifespan within which identified negative environmental impacts can be managed, mitigated and monitored within the set environmental management standards as articulated in the Environmental Management Act (Act No. 7 of 2007), and EIA Regulations (Government Notice No: 30, 2012).

2. Objectives

- EMP provides details on the specific tasks and actions that must be undertaken for environmental management requirements in addressing environmental emergencies, the performance criteria for such actions, the responsible persons, reporting procedures, compliance auditing and inspection programmes by the proponent, site manager, qualified technical service providers or appropriate institutions.
- In addition, the EMP specify the periodicity of the audits to be carried out including an estimate of capital and operational costs pertaining to the proposed developments.

3. Environmental Monitoring and Evaluation

The EMP identifies monitoring objectives and specify the type of monitoring measures to be employed, including the parameters to be measured and methods to be used, performance indicators, sampling locations, frequency of measurements, detection limits, and thresholds that will signal the need for corrective actions.

4. Environmental Contingency Plans

Environmental best practices and standard operating procedures in freshwater aquaculture and horticulture should include the environmental contingency plans that may need to be formulated in conjunction with an EMP. These plans may include: waste management plan; emergency response plan; workers health and safety plan; disease, parasite and pest management plan, farm management plan and participatory plan.

5. Conclusion

The EMP must be communicated to all employees, the applicable local and regional government authorities, traditional authorities and emergency services. In order to maintain an acceptable level of preparedness, the plan should be regularly updated.

Table 1: EMPr for proposed freshwater aquaculture and horticulture projects

Environmental Management Programme: Implementation Phase					
Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
NEGATIVE ENVIRONMENTAL IMPACTS OF CONSTRUCTION ACTIVITIES					
Land uses and user conflict	Potential user conflict over land ownership & other natural resources	<ul style="list-style-type: none"> To avoid user conflict, when selecting sites, farmers should consider the neighbouring land users and how their activities could potentially affect their farms, and vice versa. Acquisition of land and other communal resources must be done according to the correct procedures. Communication channels for complaints should be established, so that should a member of the public have a concern about the project, it will be dealt with by the appropriate authority. 	-Proponent -TA -MAWLR -Oshana Communal Land Board	-Possession of land ownership certificate. -Customary land rights certificate. -No conflicts with neighbours.	-Complaints over resource use/land use.
Environmental	Habitat degradation and ecological disturbance	<ul style="list-style-type: none"> Natural features such as trees, natural vegetation and surface depressions should be protected when found in proximity to the surroundings of the project site. Such ecologies and the related biodiversity should not be disturbed and unmaintainable. Excavate areas only to be affected by buildings. Dumping of excess excavated materials to sites designated by EMA. Restoration of sites excavated An invasive species monitoring, control and eradication plan must be implemented as part of the EMPr. 	-Contractor -Proponent -Site Engineer -Landscape Architect -MAWLR -MEFT	-Absence of soil erosion. - Renaturalisation/ Landscaping. -Intact forest landscapes & biodiversity resources. -Visual inspection.	-Degraded land. -Ecological destruction and depletion of resources. -Loss of fertile soils to erosion.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Safety and security	Security breach	<ul style="list-style-type: none"> • Access to the farms must be controlled for security reasons and to prevent uncontrolled movement of individuals and vehicles that may cause environmental degradation. • Facilities must be fitted with a gate for access control. Prohibition of entry by unauthorised persons must be displayed on gates. • Perimeter fences, perimeter wall and boundaries must disallow free access of unauthorised persons. • Facilities and stores must be kept locked after hours and when the site is not occupied. • Production facilities must be inspected at least once each day by the on-site management team. • In general, access to sensitive areas surrounding aquaculture and horticulture facilities should be restricted and employees should be educated to their sensitivity including to the excavated dam on site. • Have a single-entry point that is manned 24 hours. 	-Proponent -Contractor -Site Manager - Neighbourhood associations	-Weekly fence inspections. -Presence of perimeter fence. -Presence of security guard/s.	-Security breach incidents.
General aquaculture and horticulture operations	Excessive water use	<ul style="list-style-type: none"> • Taps must be closed when not in use and pipes must be maintained to prevent leakage and waste. • Increase water storage capacity by installing water tanks. Adopt the use of the 3rs i.e., reduce, re-use, recycle. Water for landscaping should be used sparingly and, where possible, be sourced from aquaculture discharges or from grey water generated by washing and other non-sewerage activities. 	-Proponent -Contractor -MAWLR	-Metering of water. - Storage tanks. - Presence of reservoir/excavated dam.	-Water wastage incidents. -Water runoff. -Visual inspection -Pipe leakages

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Health and safety	Risks of accidents and injuries to workers	<ul style="list-style-type: none"> Adhere to the occupational health and safety rules and regulations for the Health and Safety of Employees at Work (Labour Act, 6 of 1992). Appropriate personal protective equipments (PPE) such as hand gloves, boots, helmets, safety goggles, overalls, as well as ensuring a safe and healthy environment for construction workers by providing sanitary and ablution facilities should be provided by the contractor. This should also include the provision of the first aid kits on site, emergence response plan, education and proper instruction on the use of tools and equipments as per specifications as well as proper building supervision. An appropriate number of fire extinguishers and firefighting equipments must be available around the project facilities. 	<ul style="list-style-type: none"> -Contractor -Proponent -Labour inspector 	<ul style="list-style-type: none"> -Presence of well-equipped first aid kit. - Presence of security guards on site - Presence of incident register on site. -Presence of emergence response plan. -Securing the Site/dam by fencing off. 	<ul style="list-style-type: none"> -Health and safety incidents.
General aquaculture and horticulture operations	Solid waste generation	<ul style="list-style-type: none"> Green Village must take steps to minimize the generation of such waste and to ensure proper disposal procedures. Provide facilities for handling solid waste generated within the facility e.g., dust bins or skips for temporarily holding waste within the premises before final disposal at the designated dumping site in the area. 	<ul style="list-style-type: none"> -Proponent -Contractor -MHSS -Labour inspector 	<ul style="list-style-type: none"> -Absence of solid wastes on site -Absence of debris. - Presence of waste bins, refuse bags. 	<ul style="list-style-type: none"> -Large amounts of solid waste on site. - Garbage disposal smells. -Odors -Presence of rodents.

		<ul style="list-style-type: none"> • A culture of waste reduction, collection and recycling must be instilled. • Vegetation matter from landscaping activities must be removed to a suitable disposal site or composted for later use. • Composite or re-cycle some wastes accordingly depending on the national waste management strategy to be adopted in line with the Environmental Management Act of 2007 and its Regulations of 2012. • Small numbers of dead organisms can be disposed via a subterranean pit, dug out in an area that is poor in groundwater. Each disposal must be followed by plentiful amounts of lime. • Large volumes of dead organisms can be disposed of by incineration. • Hazardous waste (e.g., expired chemicals) must be disposed of via an approved hazardous waste disposal site. 		-Visual inspection	
Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Health and safety/social	Increase in noise and vibration levels	<ul style="list-style-type: none"> • Noise and vibration levels must be minimized within the project and surrounding areas through sensitization of truck drivers and machinery operators. • Works that generate high noise and vibration levels should be confined between 08:00 to 17:00 (local time). • The contractor should ensure that the surrounding or adjacent communities are informed about the planned activities. Also, ensure the use of earmuffs by workers. 	-Proponent -Contractor	-Lack of complaints from workers and neighbours. - Workers wearing earmuffs.	-Complaints over high levels of noises and vibrations.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Health and safety/social	Increase in air pollution in the form of dust and emissions	<ul style="list-style-type: none"> Dust generation and emissions during construction must be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the project site. The site's driveways should also be sprinkled with water regularly to reduce amount of dust generated by the construction works. Roads must be maintained in a stable, dust free condition by compaction, watering and road grading. 	-Proponent -Contractor	-Lack of complaints. - Workers wearing protective clothing/ dust masks. -Visual inspection	-Complaints over increase in air pollution and emissions. -Emission of air contaminates.
Health and safety/social	Traffic flow during construction	<ul style="list-style-type: none"> The flow of vehicles/traffic should be controlled. Traffic/warning/construction signage should be erected around project site to warn, give instructions or directions to road users and general public about the construction of the project. 	-Proponent -Contractor	-No complaints from workers/ neighbours. -Presence of traffic/warning signs.	-No warning or traffic signs on site. -No security guards.
Health and safety	Hazardous substances	<ul style="list-style-type: none"> Appropriate storage and handling of these hazardous substances should be done in a proper manner with proper supervision. Hazardous materials used at the site should be disposed of according to the health and safety regulations. If water has been contaminated with hazardous chemicals, it must not be released into the environment. This water must be kept in conservancy tanks for disposal at suitable hazardous chemical disposal sites. 	-Proponent -Contractor -MHSS -MEFT -Labour inspector	-The use of chemical record books. -Presence of grievance and complaints register.	-No storage and proper use of hazardous substances. -Drain discharge of hazardous materials.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Heritage and Palaeontological Environment	Possible loss of cultural, historical heritage and archaeological resources	<ul style="list-style-type: none"> • Should heritage resources (e.g., artefacts, human remains etc.) are discovered on and/or around the construction site, work must stop immediately and be reported to the relevant authorities e.g., National Heritage Council of Namibia for investigation. • Where possible, avoidance of these sensitive areas is a first priority. • All historical buildings, archaeological and paleontological materials, graves and burial grounds, wetlands, catchments, forests, sensitive habitats are protected by law and may not be disturbed or removed in any manner without authorisation to do so. 	-Proponent -National Heritage Council of Namibia -Forensic architecture -TA	-Lack of complaints from the society and communities -No findings of heritage sites, cultural, historical and archaeological resources.	-Loss of cultural, heritage and archaeological/paleontological resources -Destruction or affecting archaeological artefacts. -Complaints from the society and communities.
Environmental	Facility, materials and bulk infrastructure	<ul style="list-style-type: none"> • Site clean-up should be done by ensuring that all structures, equipments, materials, waste and facilities used during construction are removed upon completion the project. 	-Proponent -Contractor	-Absence of debris. -Removal of all materials. - Rehabilitation of the site.	-Garbage problems. -Landscape changes e.g., displacement of wildlife and vegetation, poor visual quality and opening of depressions on the surface.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Environmental	Soil erosion	<ul style="list-style-type: none"> • Where vegetation is removed, this should be done in a proper manner to prevent unnecessary destabilisation and erosion. • When undertaking any earthworks, the topsoil must be stripped separately and retained for later re-use. Topsoil stockpiles must be stable and free of invasive alien vegetation. • Following the exposure of any soils for construction or other activities, a suitable vegetation cover must be established if appropriate. Where appropriate, landscaping with environmentally compatible plants may also be used to prevent erosion. • Slopes with a gradient exceeding 2:1 should be protected from erosion. This can be accomplished with good vegetation cover, brush packing, sand bagging, retaining walls, log stepping, etc. • Paths and roads must be formalised and stabilised against erosion by means of suitable materials, compaction and functional design. Stormwater cut off trenches can be used to prevent erosion. • An invasive species monitoring, control and eradication plan must be implemented as part of the EMPr. • Unpaved roads into and around the production facilities should not contribute to erosion. 	<ul style="list-style-type: none"> -Contractor -Proponent -Site Engineer -Landscape architect 	<ul style="list-style-type: none"> -Absence of soil erosion. - Renaturalisation and intact forest landscapes. -Intact biodiversity resources. -Visual inspection. 	<ul style="list-style-type: none"> -No landscaping after completion of construction. -Degraded area. -Uncovered soil. -Water runoff. -Loss of fertile soils to erosion.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
POSITIVE ENVIRONMENTAL IMPACTS OF CONSTRUCTION ACTIVITIES					
Socio-economic	Creation of employment opportunities	<ul style="list-style-type: none"> During construction phase, short-term job opportunities will be created especially for the community of Okatana/Omayanga as construction workers. This will be a significant development as it will accord the youths an opportunity to be employed by Green Village as most of these youths are unable to secure employment. 	-Proponent -Contractor	-Job opportunities created during construction.	-Construction of the proposed projects.
Economic	Provision of market for supply of building materials	<ul style="list-style-type: none"> The project will require supply of large quantities of building materials, most of which will be sourced locally (Ongwediva and Oshakati) in hardware shops and individuals with such materials around This provides ready market for building material suppliers such hardware shops and individuals with such materials. 	-Proponent -Contractor	-Building materials acquired from local hardware shops.	-Construction of the proposed projects.
Economic	Increased business opportunities	<ul style="list-style-type: none"> High number of construction workers of various components of the project will provide market leading to business opportunities for informal traders or small-scale traders such as food vendors who will be interested to sell their goods around the construction site. 	-Proponent -Contractor	-Business opportunities created by the presence food vendors.	-Operation of the proposed projects.
Environmental	Optimal use of land	<ul style="list-style-type: none"> The selected site for this project enhances the optimal use of this particular portion of land which otherwise would be idle considering that this portion of land was previously undeveloped and uninhabited and part of it falls within the Oshanas/flood channel. 	-Proponent -Contractor	-Portion of land area developed.	-Operation of the proposed projects.
Economic	Revenue to Government.	<ul style="list-style-type: none"> Value Added Tax (VAT) on construction materials and tools to be purchased among others will be sources of revenue for the government and its institutions. 	-Proponent -Contractor	-Revenue generated	-Operation of the proposed projects.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
NEGATIVE ENVIRONMENTAL IMPACTS OF OPERATIONAL ACTIVITIES					
Legislation	Legal and policy compliance	<ul style="list-style-type: none"> During the operational phase, there should be adherence to existing policies, regulations, permits, authorisations and legal obligations for environmental management, aquaculture, agricultural matters, labour issues, health and safety issues, lands, water resources etc. These will enhance social cohesion between the project, community and stakeholders, institutional support for the project, overall project successes and protection and environmental sustainability. 	<ul style="list-style-type: none"> -Proponent -MFMR -MAWLR -MHSS -TA -RC -Labour Inspector(s) 	<ul style="list-style-type: none"> -Adhering to existing policies, regulations, permits. -Routine inspections. 	<ul style="list-style-type: none"> -Reported incidents of non-compliance.
Fish feed and feeding	Uneaten feed & faeces	<ul style="list-style-type: none"> Uneaten feed and faeces are the two most prominent waste streams in cage or tank-based aquaculture. Therefore, regular cleaning and monitoring of the quality of the water must be carefully done in order to avoid water quality deterioration due to fish farm waste (e.g., faeces and feed). 	<ul style="list-style-type: none"> -Proponent -Farm manager -Operator 	<ul style="list-style-type: none"> -Water quality monitoring. 	<ul style="list-style-type: none"> -Water quality results which do not fall within the predetermined parameters. -Water quality deterioration.
	Fish feed quality and feed wastage	<ul style="list-style-type: none"> Only high-quality aquaculture feeds must be purchased from recognised feed producers. Information on the nutrient makeup and primary ingredients should be available to the farmers. Feed storage areas must be lockable, well ventilated, dry and free of vermin that can damage, contaminate and consume feeds. Feed producers must provide the date of feed manufacture and shelf life; feed must be stored and used on a 'first-in-first-out' basis; feed storage areas must be 	<ul style="list-style-type: none"> -Proponent -Farm manager 	<ul style="list-style-type: none"> -Water quality monitoring. - Feed inspections and quality checks/quality assurance programme. 	<ul style="list-style-type: none"> -Slow growth -Water quality deterioration. -Odour. -Presence of moulds.

		<p>lockable; well ventilated, dry and free of vermin that can damage, contaminate and consume feeds.</p> <ul style="list-style-type: none"> • Feed must be stored on pallets to allow for full ventilation of bags that would otherwise be in contact with floor surfaces. • The required amount of feed per day per production unit and the FCR must be recorded in a logical fashion to prevent overfeeding; feeding rates must be correlated to water quality sampling to allow detection and alteration of over-feeding. Correct feed pellet size must be used to ensure low levels of feed wastage; factors such as feed types (floating or sinking) and feeding times of day must be considered when attempting to minimise feed wastage and the associated water pollution). • Feeding staff must be trained in feed application, as the detection of subtle changes in feeding behaviour is important. If fish are not actively feeding it may be necessary to suspend or delay feeding; feed stores should be inspected once a week. • The calculation of suitable feeding rates, record keeping of feeds and management to lessen feed wastage must be calculated on a daily basis. 		<p>-Observation of daily feeding allowance/rates/FCR. -Visual inspection -Monthly water quality reports.</p>	
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Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture operations	Potential fish escapees	<ul style="list-style-type: none"> • Install suitable strainers or screens on all piping, and in and outflow points in the facility to minimize the escape of fries, juveniles and broodstock. • The moving of fish (tank stocking, sampling, grading and harvesting) must be done in a manner, which prevents escape. • Adequate steps must be taken to prevent the escape of production organisms, especially from the hatchery environment where individual organisms may be very small. • The use of filter screens shall be designed to retain the smallest life stage present. • Make thorough inspection for holes, leakages, tears and breakages of all culture tanks before they are deployed so as to avoid possible escapees from the tanks. • No production stock may be kept in settlement and filtration ponds or any other unit not specifically designated as part of the production cycle. • When stocking aquaculture organisms, care must be taken to prevent secondary species from being accidentally introduced with the target species. • During moving or transferring of fish, a 'catch net' must be placed between the working platform where the fish are being handled and the open water. This must ensure that any fish that mistakably fall on the working deck must not escape. 	<p>-Proponent -Farm manager</p>	<p>-Regular inspection. -Verification of stocked numbers fish. - Sampling and grading every two weeks.</p>	<p>-Fish escape incidences. -Reduced fish stock numbers. Presence of holes, leakages, tears and breakages on culture tanks.</p>

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture operations	Entanglement in nets and predator related fish fatalities	<ul style="list-style-type: none"> • Employ bird-friendly net designs around greenhouses that minimize the risk of entanglement. • Shade cloth or bird netting must be of such a mesh size, structure and of rigid material so that injury of any birds and other animals is prevented. • Sunlight resistant cover netting on aquaculture facilities should be used for keeping predatory birds out; and, for providing shade over the production activities. This netting must be erected and maintained in a manner that does not pose a threat to any birds and other animals. Netting must be clearly visible by birds approaching the facility and also weather resistant to prevent it from tearing and becoming tattered especially in windy conditions. 	-Proponent -Farm manager -MEFT	-Periodical inspection -Verification of stocked numbers. -Grading and sampling.	-Reduced fish stock numbers. -Entanglement and predator related fish fatality incidents.
Social risks	Theft and vandalism	<ul style="list-style-type: none"> • Theft, poaching and vandalism can be a key concern at the farm. This can be mitigated by fencing, patrolling guards/policemen or dogs as fish farm security. 	-Proponent -Farm manager -NamPol - Neighbourhood watch	- Presence of security guards on site and fencing. -Regular patrols. -Stock verification. - 'Neighbourhood watch'.	-Theft incidents -Damages to properties.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture and horticulture operations	Use and handling of chemicals	<ul style="list-style-type: none"> • Complete chemical testing of the water is required since cultured aquatic organisms have some very specific requirements. • On-site measurement of dissolved oxygen, pH, and temperature must be performed for all potential water sources at high potential sites. • Chemical analysis of major and minor elements plus heavy metals for all submitted samples of potential water sources should be performed. • Depending on the land usage patterns, a pesticide/herbicide/fungicide screening of the prospective source waters may be recommended. • Protect areas or water bodies and other sources of freshwater from possible contamination of applications. • Nitrate is relatively non-toxic to fish, but an accumulation of ammonia and nitrite can cause mortality. Water quality results will be compared against optimum criteria for fish farming. • The use of chemicals must be done in a responsible manner and operator must ensure that no downstream environmental impacts emanate from such chemical use. Only recognised and registered chemicals may be used as treatments, medicines, herbicides, insecticides, pesticides and for other purposes. The use of chemicals must be responsible and in accordance with the prescribed application methods. Bait type pesticides 	<ul style="list-style-type: none"> -Proponent -Farm manager -MFMR -MAWLR -MHSS -Accredited Aquaculture Pathologist/ Vet or Fisheries Biologist/Tech nician 	<ul style="list-style-type: none"> -Complete chemical testing of the water at least once a month -Inspection of the chemical stores for expiry dates, condition etc.) must be done regularly i.e., once in 3 months. 	<ul style="list-style-type: none"> -Lack of water screening -Water quality results which do not fall within the predetermined parameters. -Water quality deterioration. -Lack of register for chemical use and handling. -Generation of hazardous waste. -Drain discharge of hazardous materials. -Spills of hazardous materials on site.

		<p>should be used with care to prevent poisoning of non-target species.</p> <ul style="list-style-type: none"> • Encourage integrated plant nutrition systems by combining mineral fertilizers with organic inputs such as farm yard or green manure. • Increase the efficiency of organic fertilizer use while limiting environmental pollution. Limit chemical fertilizer applications by promoting the use of biological nitrogen fixation or other processes that might reduce fertilizer requirements. Expired products and empty chemical containers must be disposed of responsibly at a recognised disposal site for these materials and according to the directions provided in the datasheet. 			
Diseases & parasites	Outbreak of disease and spread of diseases	<ul style="list-style-type: none"> • Even though Tilapias are resilient towards fighting off diseases and parasites; proper management and biosecurity protocols must be followed as fish disease spread due to poor farm management strategies. • Select healthy fish, provide a nutritious diet, limit stress and vaccinate if really necessary. • When new juveniles or broodstock are introduced or prior to entering the hatchery environment, it is advisable that these be quarantined and screened to diagnose, investigate, monitor and treat potential diseases and parasites. This should be done under supervision of a veterinary professional. • Treatment of diseases must be done by recognised methods and under the guidance of recognised aquaculture pathologists, vet or fisheries 	<ul style="list-style-type: none"> -Proponent -Farm manager -Accredited Aquaculture Pathologist/ Fisheries Biologist/Tech nician -MFMR -MAWLR/DVS -MHSS -TA/Headman 	<p>A routine screening for diseases and parasites must be conducted by a recognised aquaculture pathologist.</p> <p>-All units must be inspected daily for dead organisms and these</p>	<ul style="list-style-type: none"> -Outbreak of diseases. -Presence of parasites. -Clear records must be kept.

		<p>biologist/technician/animal health technician. All treatments must be recorded. Diagnosis of the cause of largescale mortalities must be done as soon after such an incident as possible.</p> <ul style="list-style-type: none"> • Isolation and separation of production sectors with independent water supplies and equipment. • Regular disinfection of equipment and working areas. • Unless specifically authorised, broodstock or organisms for farming may not be collected from the wild. • Diagnosis of the cause of largescale mortalities must be done as soon after such an event as possible. 		<p>must be removed and disposed of without delay.</p> <ul style="list-style-type: none"> - Strict adherence to biosecurity protocols. 	
Diseases & parasites	Mortalities	<ul style="list-style-type: none"> • All mortalities must be recorded and the associated behaviour of the remainder of the organisms monitored, e.g., loss of appetite. If uncontrolled mass mortalities occur, it should be reported immediately to the relevant authorities and these are: MFMR, MAWLR, headmen. 	<ul style="list-style-type: none"> -Proponent -Farm manager -MFMR -MAWLR/DVS -TA/Headmen 	<ul style="list-style-type: none"> -All units must be inspected daily for dead fish and these must be removed and disposed of. 	<ul style="list-style-type: none"> -Mass mortalities -Mortality records. -Outbreak of diseases. -Accumulation of predators.
Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Public health	Consumer related risks, quality assurance and ethical concerns	<ul style="list-style-type: none"> • One of the greatest risks, not only to the individual farmer and his trader, but to the industry as a whole, is if the health of a consumer is compromised. Any risks to public health could cause closure of the producer's farm and a stringent examination of all neighbouring farms. Consumer faith in the farming products could be lost. 	<ul style="list-style-type: none"> -Proponent -MFMR -MAWLR -MHSS -NSI -TA/Headmen 	<ul style="list-style-type: none"> Lack of complaints from customers/ clients. 	<ul style="list-style-type: none"> -Absence of biosecurity measures. -No regular inspection by

		<p>Responsible institutions must ensure that the value chain is educated on the correct farming practices and handling of all processes of the production line from 'farm to fork'. Health risks and symptoms should also be communicated to responsible stakeholders.</p> <ul style="list-style-type: none"> • Farmed aquatic organisms and cultivated vegetables destined for various local market must comply with the regulations of food safety and biosecurity protocols by the competent authority for certification. • Product quality will be monitored by the competent authority in order to promote a generic quality image for Namibia especially farmed aquatic organisms. • To satisfy ethical concerns and to pre-empt potential damage to the fisheries industry; hygiene, feeds, and acceptable methods of humane handling and harvesting for fish must be promoted and emphasised. 		<p>-Well-regulated supply chain and markets. - Value-chain infrastructure - Hygiene measures implemented.</p>	<p>relevant authorities</p>
<p>General aquaculture operations</p>	<p>Tank structure failure and loss of fish stock</p>	<ul style="list-style-type: none"> • The tanks must be regularly inspected to ensure the stable positioning and anchoring of the tanks at all times. • Tank platforms must be kept in good order (clean, tidy and free of unnecessary build-up of organic sediments). • Tank netting must be kept clean, free of algal growth and free of any damage or holes that could lead to fish escape or the penetration of predators. • No chemicals may be used in the cleaning of the cage nets unless approval is obtained from the authorities. 	<p>-Proponent -Farm manager</p>	<p>-Inspection of the entire structural safety of the tanks must be undertaken every 3 months (Quarterly basis).</p>	<p>-Leakages. -Mechanical faults.</p>

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture operations	Fish handling	<ul style="list-style-type: none"> Fish must not get stressed. If you handle the fish, take great care so that you upset them as little as possible. Extreme stress can be the direct cause of fish death. Damage to their skin (rubbing off the scales and the protective slime layer), means pathogens can enter the fish more easily. 	-Proponent -Farm manager	-Visual inspection. -Presence of appropriate equipments and tools. -Well trained staff.	-Stunted/slow growth. -Motilities. -Stressed fish. -Lack of appropriate equipments and tools.
General aquaculture operations	Quality fingerlings	<ul style="list-style-type: none"> Poor quality fingerlings may die or even fail to grow and this would result in a loss of investment. So only good quality fingerlings from reputable suppliers i.e., MFMR's Inland Aquaculture Centres will be used. 	-Proponent -Farm manager -MFMR	-Reputable suppliers. -Follow-up visits by MFMR.	-Stunted/slow growth. -Motilities.
General aquaculture operations	Poor management	<ul style="list-style-type: none"> Site-specific high-level Standard Operating Procedures (SOPs) that are in-line with international best management practices must be maintained for the management of fish genetics, hatchery and fingerling production, fish feed, fish health, biosecurity and the general environment. 	-Proponent -Farm manager	-Introduction of disease, parasites and new genetic strains.	-Lack of appropriate equipments and tools. -Poorly trained staff. -Lack of management records.
Compliance and permitting	Import & export permits	<ul style="list-style-type: none"> No live organisms may be transported to or from any aquaculture facilities without a transport permit from the applicable authority. 	-Proponent -MFMR -MAWLR	-Routine inspections by MFMR and MAWLR.	-Absence of Import and/or export permits

		<ul style="list-style-type: none"> • No aquaculture organisms may be imported into the aquaculture production facility from unrecognised sources, and all imported ova and fingerlings need to be certified disease free by the supplier. • Unless specifically authorised, broodstock or organisms for farming may not be collected from the wild. • Aquaculture species that are able to hybridise should not be farmed together, while species that are able to hybridise with indigenous species in the surrounding environment should not be used as production candidates. It is required to have all stock checked and certified as disease free prior to introducing such organisms into the production facility. Import and export permit must be obtained from the relevant authority i.e., MFMR, MAWLR or NamRa depending on the application. 			
General aquaculture and horticulture operations	Water use	<ul style="list-style-type: none"> • The proponent shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage. Employ water saving measures such as aquaculture recirculation system. Provision of increased water storage capacity of tanks. Use of the 3rs - reduce, re-use, re-cycle. Provide roof gutters to collect and direct roof water to garden/trees around the site. • Aquaculture production systems should be structurally sound and not leak unnecessarily. Water for landscaping should be used sparingly and, where possible, be sourced from aquaculture discharges or from grey water (non-sewerage activities). 	-Proponent -Farm manager	-Metering of water usage. -Storage tanks. -Water conservation measures e.g., drip irrigation; recirculation system; and waste water re-use for the crops/plants.	-Excessive water consumption incidents. -Water runoff. -Visual inspection

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture and horticulture operations	Solid waste generation	<ul style="list-style-type: none"> • Provide facilities for handling solid waste generated within the facility. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at the designated dumping site in the area. • Composite or re-cycle some wastes accordingly, depending on the national waste management strategy to be adopted in line with the Environmental Management Act of 2007 and its Regulations. • The use of the 3rs – reduce, re-use, re-cycle must apply. • Additionally, ensure waste materials are disposed or channelled to the approved sites. The disposal of contaminated or diseased and dead fish must comply with public health and veterinary procedures. 	-Proponent -Farm manager -MEFT	-Absence of solid waste on the site. -Absence of debris. - Presence of waste bins and refuse bags.	-Large amounts of solid waste on site. -Visual inspection
General aquaculture and horticulture operations	Generation of liquid waste and effluent	<ul style="list-style-type: none"> • The most profitable use of the sludge generated by aquaculture operations is as fertiliser for agriculture. Treatment of waste which can later be re-used. The use of the 3rs – reduce, re-use, re-cycle must apply. Additionally, ensure waste materials are disposed or channelled to the approved sites. • The use of aquafeeds, chemical fertilizers and organic manures in production shall be consonant with the discharge requirements stipulated by relevant legislation and the health requirements of MHSS. • Farm effluents entering inland aquatic environments shall be monitored and controlled through regulations within water legislation. 	-Proponent -Farm manager -MEFT -MFMR	-Conventional sewer line and/or septic tanks - Presence of waste bins - Absence of wastes.	-Large amounts of waste/effluent on site. -Drain discharge of liquid waste and effluent. -Visual inspection -Blockage of pipes. - Effluent disposal smells/odour.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture and horticulture operations	Stormwater impacts	<ul style="list-style-type: none"> • Provide roof gutters to collect and direct roof water to drains or collected to be used for orchard or gardens. • Provide adequate storm water drainage system and sewer system. • Conduct regular inspection and maintenance of the waste disposal systems during the operation phase. 	-Proponent -Contractor -Farm manager	-Absence of flooding and dampness in the facilities. - Absence of run-off. - Pavements and drainage channels.	-Drainage channels that aren't working/full. -Runoff/water around facilities.
General aquaculture and horticulture operations	Abstraction of water	<ul style="list-style-type: none"> • The area must have a parameter fence to prevent access and uncontrolled movement of individuals into the dam area/reservoir. • The facilities must be fitted with a gate for access control. Prohibition of entry by unauthorised persons must be displayed on gates. • Water for other uses on site must be done efficiently to conserve it. 	-Proponent -Farm manager	-Presence of fencing. -Proper signage. - Awareness creation.	-User conflicts reports/records.
Health and safety/social	Noise pollution and vibration	<ul style="list-style-type: none"> • Although aquaculture activities don't really generate a lot of noise. Works that generate high noise and vibration levels should be confined between 08:00 to 17:00 (local time). The contractor should also ensure that the surrounding or adjacent communities are informed about the planned activities. Also, ensure the use of earmuffs by workers. 	-Proponent -Farm manager	-Lack of complaints. -Workers wearing earmuffs.	-Complaints about increase noise and vibration levels.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Health and safety	Traffic during operations	<ul style="list-style-type: none"> Provide adequate parking facilities within the project site, designing the site entrance to ease traffic that may occur when cars are entering/leaving the site. Erect proper signage for directions. 	-Proponent -Farm manager	-Presence of ample parking in the premises.	-Complaints about lack of parking space or high traffic volumes.
Health and safety	Onsite sanitation and ablutions	<ul style="list-style-type: none"> Adequate and accessible sanitary and ablution facilities for both sexes with clean running water for workers and visitors alike should be provided. 	-Proponent -Farm manager	-Adequate facilities with clean running water.	-Absence or dirty facilities with no clean running water.
Labour issues: Health and safety	Risks of accidents and injuries to workers and health & safety of workers on site	<ul style="list-style-type: none"> Provide appropriate personal protective equipments (PPEs). Provide safe and healthy environment for workers by providing sanitary and ablution facilities. This should also include the provision of the first aid kits on site, emergence response plan, education and proper instruction on the use of tools and equipments as per specifications as well as proper building supervision. An appropriate number of fire extinguishers and firefighting equipment must be available at aquaculture facilities. Contact numbers for the nearest firefighting and emergency services must be clearly displayed in an accessible area. Employees must be provided with opportunities for training and furtherance of skills. 	-Proponent -Farm manager -Labour inspector	-Routine operation procedure. -Presence of well-equipped first aid kits. - Presence of incident register on the site. -Presence of emergence response plan.	- Health and safety incidents.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Energy consumption	Electrical system and energy consumption	<ul style="list-style-type: none"> The facility will use a lot of electrical energy mainly for running the recirculation system, filters, aerators, pumping water from reservoirs into the facilities, lighting, running of refrigeration systems etc. The project will also use electricity supplied by the already existing electricity main grid of NORED which will be used in all phases of the project. Therefore, avoid the excessive use of electricity consumption. Future plans of using renewable resource (solar energy) are highly recommendable. 	-Proponent -Farm manager	- Presence of NORED power lines and standby generators. Presence of energy consumption meters and solar panel.	-Faults power lines. -High and excessive electricity/energy consumption. -Excessive electricity consumption.
Health and safety	Dust generation and emissions	<ul style="list-style-type: none"> The site should also be sprinkled with water regularly to reduce amount of dust generated by the construction work. Have paved local access road and walkway system. Roads must be maintained in a stable, dust free condition by compaction, watering, grading and asphalt coverage where necessary. 	-Proponent -Farm manager	-Lack of complaints. - Workers wearing protective clothing and earmuffs.	-Complaints over increase in air pollution and emissions from the visitors, workers and neighbours.
Health and safety	Hazardous substances	<ul style="list-style-type: none"> Appropriate storage and handling of hazardous substances should be done in a proper manner with supervision. All hazardous materials used on site should be disposed of according to the health and safety regulations. If water has been contaminated with hazardous chemicals, it may not be released into the environment. This water must be kept in conservancy tanks for disposal at suitable hazardous chemical disposal sites. 	-Proponent -Farm manager -MHSS -MEFT -Labour inspector	-The use of chemical record books. -Presence of grievance and complaints register. -Chemical testing.	-No storage and proper use of hazardous substances. -Drain discharge of hazardous materials.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Heritage and palaeontological resources/ Environmental	Possible loss of cultural, historical heritage and archaeological resources	<ul style="list-style-type: none"> Should heritage resources (e.g., artefacts, human remains/bones etc.) are discovered on and/or around the site, these should be reported to the National Heritage Council of Namibia for investigations. 	-Proponent -Farm manager - National Heritage Council of Namibia -Forensic architecture -TA	-Lack of complaints from the society and communities -No findings of heritage sites, cultural, historical and archaeological resources.	-Loss of cultural, heritage and archaeological/palaeontological resources -Destruction or affecting archaeological artefacts.
Environmental	Soil erosion	<ul style="list-style-type: none"> All soils must be stable, protected from erosion and maintained as a suitable growth medium for natural vegetation where applicable. Slopes with a gradient exceeding 2:1 should be protected from erosion. This can be accomplished with good vegetation cover, brush packing, sand bagging, retaining walls, log stepping, etc. Paths and roads must be formalised and stabilised against erosion by means of suitable materials, compaction and functional design. Stormwater cut off trenches can be used to prevent erosion. Roads must be maintained in a stable, dust free condition by compaction, watering, grading and asphalt coverage where necessary. 	-Proponent -Site engineer -Landscape architect	-Absence of soil erosion. - Renaturalisation and intact forest landscapes. -Intact biodiversity resources.	-No landscaping after completion of construction. -Degraded land. -Uncovered soil. -Water runoff. -Loss of fertile soils to erosion. -Visual inspection.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
Environmental	Floods	<ul style="list-style-type: none"> Although the area may not be susceptible to floods as the site was filled with gravel (in some areas) to the elevated height, flood risk measures should be put in place. Reinforce on embankments already put around the facility to block water from passing through the facility during flood and rainy season. Design storm water drainage channels, and provide adequate storm water drainage system. 	<ul style="list-style-type: none"> -Proponent -Farm manager -Site Engineer --Hydrological Services of Namibia 	<ul style="list-style-type: none"> - Lack/absence of flood. -Presence of storm water channels. 	<ul style="list-style-type: none"> -Flooded area. -Water runoff. -Absence of storm water channels.
Climate change	Extreme weather events	<ul style="list-style-type: none"> Extreme weather events can have detrimental effects on aquaculture operations. Green Village should have access to climate change information and implement specific farm management measures for coping with the associated stresses. The aquaculture value chain, need to implement climate change adaptation measures. 	<ul style="list-style-type: none"> -Proponent -Farm manager -MAWLR -Namibia Meteorological Service 	<ul style="list-style-type: none"> -Erratic weather events. -Proper mitigation measures. 	<ul style="list-style-type: none"> -Climate change effects.
Conservation	Invasion of Alien vegetation species	<ul style="list-style-type: none"> Topsoil stockpiles must be stable and free of invasive alien vegetation. An invasive species monitoring, control and eradication plan must be implemented as part of the EMPr. 	<ul style="list-style-type: none"> -Proponent -Site manager -Landscape architect 	<ul style="list-style-type: none"> -Land restoration. -An invasive species monitoring, control and eradication plan must be implemented as part of the EMPr. 	<ul style="list-style-type: none"> -Disturbed areas. -Ecological destruction.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
General aquaculture and horticulture operations	Keeping of production records	<ul style="list-style-type: none"> Comprehensive records on the whole operation must be kept e.g., fish species, water quality data, feeds and feeding, health records, chemical and treatment application records, mortality records etc. Farm records should be written or electronically logged in a logical and tidy manner. Record should be safely kept and accessible for daily management and reference. Where possible, farm records should be supported by authorisations, permits, photographs, water quality analysis reports, disease or diagnostic reports, incident reports and other information that may be of assistance. 	-Proponent -Farm manager	Presence of production records of operations.	-Absence of production records on activities and operations, or records simply not updated.
General aquaculture and horticulture operations	Dealing with complaints	<ul style="list-style-type: none"> All complaints must be recorded in well-kept complaints register with details of the nature of the complaint, the person or organisation that lodged the complaint, the date and the name of the responsible person dealing with the complaint. Complaints must be fully investigated and the outcomes and actions documented, implemented, monitored and communicated to the complainants. 	-Proponent -Farm manager -Headman	-Lack of complaints from clients, customers, stakeholders. -No social conflicts with neighbours over resource use.	-A lot of complaints raised.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
POSITIVE ENVIRONMENTAL IMPACTS OF OPERATIONAL ACTIVITIES					
Economic	Individual Investment	<ul style="list-style-type: none"> Economically, the project will be an investment to the proponent. The proposed project once complete can also be used as a collateral asset. To pass on knowledge about integrated aquaculture. To promote aquaculture in the area. 	-Proponent/ Operator	-Property value/Investment	-Operation of the proposed projects.
Socio-economic	Employment opportunities	<ul style="list-style-type: none"> Some people will be employed by the project as management agents, caretakers, cleaners, security personnel and technicians. During the Operational Phase, the proposed development will create permanent employment opportunities during the lifespan of the development. Job creation. During the operational phase, the proposed development will create permanent employment opportunities during the lifespan of the development. 	-Proponent/ Operator	-Job opportunities created and workers are employed at the facility	-Operation of the proposed projects.
Socio-economic	Improved food security and nutritional value	<ul style="list-style-type: none"> Food security, nutritional status and diet will be ensured to the community of Okatana constituency by providing cheap source of fish protein through consumption of local fish and fish products especially those who cannot afford to buy meat. 	-Proponent/ Operator	-Food and nutrition security improved	-Operation of the proposed projects.
Economic	Revenue to local, regional and national governments	<ul style="list-style-type: none"> Through payment of relevant taxes, rates and fees to the government and the local authority, the housing project will contribute towards the national and local revenue earnings. 	-Proponent/ Operator	-Revenue collection	-Operation of the proposed projects.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
POSITIVE ENVIRONMENTAL IMPACTS OF OPERATIONAL ACTIVITIES					
Conservation and sustainability	Added value and integrated farming	<ul style="list-style-type: none"> The project should provide opportunity for added value and integration of fish farming into the other farm enterprises in order to create additional income and improve its water management (fish-crop-livestock integration) – (fish/horticulture/poultry). This means, grey water from the greenhouse establishment should be reused to other projects on site which would really boost food production and improve management of water resources. The intention is to integrate the aquaculture project with the vegetable production by recycling water from the greenhouse/fish tanks and use it for watering the small-scale garden project. Pond sediments will be used to fertilise the vegetable gardens and orchards, thereby reducing cost of manuring of vegetables. 	-Proponent/ Operator	-Added value and integrated farming system: Fish/horticulture/poultry	-Operation of the proposed project.

Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
NEGATIVE ENVIRONMENTAL IMPACTS OF DECOMMISSIONING ACTIVITIES					
General aquaculture and horticulture operations	Solid Waste	<ul style="list-style-type: none"> • Ensure that all temporary structures, equipments, materials, waste and facilities used for operation purposes are removed upon decommissioning phase. Site clean-up shall be to the satisfaction of the responsible institutions. • There will be opportunities for recycled materials that can still be re-used for other purposes. • Ensure waste materials are disposed or channelled to the approved sites. 	-Proponent -Contractor	-Absence of Solid waste on the site. -Absence of debris. - Presence of waste bins.	-Large amounts of solid waste on site. -Visual inspection
Health and safety	Noise and Vibration	<ul style="list-style-type: none"> • Works that generate high noise and vibration levels should be confined between 08:00 to 17:00 (local time). Ensure that the surrounding or adjacent communities are informed about the planned activities. Also, ensure the use of earmuffs by workers. 	-Proponent -Contractor	-Lack of complaints from workers and neighbours. - Workers wearing earmuffs.	Complaints over high levels of noise and vibrations.
Environmental	Facility, materials and bulk infrastructure	<ul style="list-style-type: none"> • Ensure that all temporary structures, equipments, materials, waste and facilities used for operation purposes are removed upon decommissioning phase. Site clean-up shall be to the satisfaction of the responsible institutions. 	-Proponent -Contractor	-Absence of debris -Removal of all materials. - Rehabilitation of the site.	-Landscape changes. -Poor visual quality. -Accumulation of debris.

Environmental	Erosion management	<ul style="list-style-type: none"> An invasive species monitoring, control and eradication plan must be implemented as part of the EMPr. Following the exposure of any soils for construction or other activities, a suitable vegetation cover must be established if appropriate. Where appropriate, landscaping with environmentally compatible plants may also be used to prevent erosion. 	-Proponent -Contractor -Landscape architect	-Absence of soil erosion. -Intact biodiversity resources.	-No landscaping after closure. -Landscape changes. -Degraded land. -Uncovered soil. -Visual inspection.
Component	Potential Environmental Impact	Mitigation	Responsibility	Monitoring Mechanism	Indicator/ Performance Criteria
POSITIVE ENVIRONMENTAL IMPACTS OF DECOMMISSIONING ACTIVITIES					
Environmental	Rehabilitation	<ul style="list-style-type: none"> Upon decommissioning the project, rehabilitation of the project site should be carried out to restore the site to acceptable status. This will include replacement of topsoil and re-vegetation that will lead to improved visual quality of the area. 	-Proponent -Contractor -Landscape architect	- Rehabilitation of the site Lack/absence of Soil -Erosion	-Landscaping after completion of demolishing.
Socio-economic	Employment opportunities	<ul style="list-style-type: none"> Several employment opportunities will be created for demolition staff. 	-Proponent -Contractor	-Jobs created during demolishing phase	-Demolishing of the project.
Socio-economic	Opportunities for business	<ul style="list-style-type: none"> There will be opportunities for project materials that can still be recycled to be re-used for other purposes. 	-Proponent -Contractor	-Recycled materials removed, sorted and sold out.	-Recycled materials re-used elsewhere