

APPENDIX 2A OPERATION MEASURES AND PRACTICES

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2A.1 Operational Arrangements to be Managed by AFCD

The following operation measures and practices have been considered during the design of the new FCZ management. AFCD will manage these measures and practices for the new FCZs to minimise impacts to the surrounding environment. These measures and practices have been considered in the impact assessment.

2A.1.1 Control of Standing Stock Capacity

AFCD will limit the number of fish farm licenses issued to control the standing stock of the Project site within its maximum allowed carrying capacity as identified in this EIA study.

2A.1.2 Specifications of Fish Farm Layout

A sufficient separation distance (e.g. around 100 m) will be provided between each fish farm unit ⁽¹⁾ with typical size around one hectare of sea area to allow sufficient space for operation around the fish rafts / cages and with this separation distance, changes in hydrological and flow regime of the marine environment are not anticipated. The detailed number, size and separation distance of the fish rafts / cages would be determined during a later stage. A clearance of at least 200 m is typically required from established coral communities when designating locations of fish rafts / cages for each licensee. Also, at least 2 m of clearance from the seabed should be maintained at all times, except for integrated multi-trophic aquaculture (IMTA) when certain part of the mariculture setup might stay at / near bottom of the water column.

2A.1.3 Fish Farm Operational Plan

Fish farm owners are required to submit a fish farm operational plan during the licence application to allow a more stringent control of fish farm operation and minimise environment impacts. AFCD shall inspect the plan and provide recommendations to fish farm owners. The fish farm operational plan may include but not limited to:

- An overview of the mode of mariculture to be conducted;
- Area required for the operation;
- An overview of the layout of the farm;
- A description of the culture equipment required;
- List of species proposed for culture;
- Estimated annual production;
- Fish escape plan (such as the reporting procedures, etc.);
- Environmental management plan (such as the identification of potential environmental impacts and mitigation measures, etc.);
- Environmental monitoring plan (such as water quality monitoring schedule and procedures, etc.); and
- Mitigation actions to be taken in response to specific events or incidents.

The operational plan will be evaluated by AFCD considering at least the following components as listed in **Table 2A.1** to minimise impact of FCZ operation on fisheries resources and the marine environment:

(1) Each fish farm unit can consist of multiple fish rafts / cages.

Table 2A.1 FCZ Management Requirements

Monitoring and Control Measures	Frequency	Personnel Involved
Checking and maintaining appropriate stocking density	Weekly	Fish farm owner and / or worker
Regular cleaning of fish raft / cages	Weekly	Fish farm owner and / or worker
Feeding fish stock using pellet feed / alternative feed with better feed conversion ratio	Daily	Fish farm owner and / or worker
Appropriate disposal of dead fish and garbage	Daily	Fish farm owner and / or worker
Disinfection and maintenance of fish farm facilities	Weekly	Fish farm owner and / or worker and professional personnel e.g. scuba divers
Monitoring of health condition of fish stock and implement proper treatment for sick fish	Daily	Fish farm owner and / or worker and professional personnel e.g. veterinarian
Regular water quality monitoring	Daily	Fish farm owner and / or worker

2A.1.4 Biosecurity and Disease Management

Biosecurity should be implemented for all fish stocks imported, and ensure fish stock has undergone quarantine procedures to ensure the health of cultured fish and prevent the spread of diseases if identified. More frequent monitoring of fish farms might be needed during summer time as a majority of fish diseases are related to elevated water temperature and any infections, if observed, should be reported to AFCD.

In the event of a disease outbreak, the licensee should report the outbreak to AFCD within 24 hours. The diseased fish should be isolated and any therapeutics (e.g. antibiotics) that are used should be certified and approved by relevant authorities and administered in accordance with the recommended dosage and withdrawal period. Equipment must be disinfected prior to the movement out of licensed area. Other mariculture operators within the FCZ must be informed immediately. The licensee should also keep record of the event for submission to AFCD upon request.

Fish mortality of a significant number may also lead to the spread of disease and cause deterioration in water quality within FCZ, thus, these fish should be removed from the water immediately and disposed of at the nearest refuse collection point on land. In the unlikely case that significant amount of dead fish occur, the licensed fish farmers would inform AFCD immediately. AFCD will then liaise with relevant Government departments (e.g. Food and Environmental Hygiene Department, Marine Department) to collect the dead fish from the Project site directly as necessary. Dumping of fish carcasses in the water is not permitted.

2A.1.5 Fish Escape

Escaped farmed fish have a potential to out-compete wild population for habitat and food. Biosecurity risks may be resulted as the fish may spread disease and pathogens to the wild population. Cage nets must be inspected regularly to ensure the nets are in good condition to avoid unexpected escapes. It is also important to have a response plan in relation to potential fish escape. The licensee should take immediate action to control any escape and report any suspected escape from a fish farm to AFCD. The scale of fish escape and species of escape should be reported. Circumstances which give rise to significant risk of fish escape should also be reported to AFCD.

2A.1.6 Use of Pellet Feed

Trash fish is variable in freshness and susceptible to spoilage due to its high moisture content (~70%); it also favours the transmission of parasitic and infectious disease, therefore creating fish feed wastage and water pollution if not stored properly. Given the potential environmental impact to the surroundings, trash fish will not be permitted as fish feed within the Project site.

Dry pellet fish feed in contrast contains less moisture (~10%), which is mainly made of fishmeal, protein from other animal or plant origin, fish oil or other kinds of lipids, vitamin premix, minerals and binders bounded into pellet form. Only commercial pellet feeds or alternative feed with better feed conversion ratio should be used within the Project site.

2A.1.7 Waste Management

Waste management is important to reduce the potential impact of mariculture operation to the marine environment. Wastage material (such as fish carcasses, residual feed and operational waste) must be placed in sealed waste containers on site and securely disposed at refuse collection point on land. To avoid water contamination and spreading of germs, fish carcasses on the water surface must be collected and disposed of immediately in sealed waste containers for delivery to the nearest refuse collection point. Application of pharmaceutical drugs / antibiotics / vaccines on fish should be performed on the fish raft within enclosed tanks / containers. All pharmaceutical waste should be disposed of properly using relevant waste containers. Disposal of chemicals should follow regulations stated under the *Waste Disposal Ordinance Cap (354)*.

2A.1.8 Cleaning of Fish Farming Equipment

Nets should be cleaned thoroughly before each production cycle and no nets or other equipment should be dropped to the sea for the purpose of storage or cleaning. Disinfection of equipment could be conducted by bleaching, streaming or drying under sunlight on the mariculture raft off the waters to avoid pollution to the surrounding waters by disinfectants.

2A.1.9 Water Quality Regulation and Control

Currently, AFCD conduct regular water quality monitoring at all FCZs in Hong Kong with one of the real-time water quality monitoring systems located at Tap Mun FCZ to report water quality continuously for early detection of abnormality and issuance of alerts to mariculturists. For this Project, in addition to the water quality monitoring to be conducted in Environmental Monitoring and Audit (EM&A) exercise and reported in the Water Quality Monitoring Reports under EIAO (details are provided in the *EM&A Manual*), real-time water quality monitoring stations will be installed by AFCD at the Project site after its establishment and the nearby real-time monitoring station of Tap Mun FCZ will also help to provide useful information on water quality in vicinity of the Project site. Weekly sampling of seawater for analysis of phytoplankton will be conducted by AFCD at Tap Mun FCZ for maricultural condition monitoring purpose and sampling frequency will be increased when harmful algal species or abnormally high phytoplankton populations are detected. Prompt alerts will be issued to mariculturists where required and would provide valuable information to the new FCZ of the Project site as well.

All the workers and mariculturists working in the FCZ will be required to implement practical measures (e.g. regular sewage collection by licensed collectors, etc.) to comply with the relevant environmental control in handling sewage and wastewater under the *Water Pollution Control Ordinance (Cap. 358)*.

2A.2 Recommended Best Practices

With the proposed Project design and implementation of the specific mitigation measures proposed in the report to mitigate the potential impact from the Project, no unacceptable environmental impact is anticipated. Nonetheless, the following best practices would also be adopted as necessary at the proposed fish culture zone under the modern mariculture for environmental benefits.

2A.2.1 Optimal Feed Input

Optimal feed input (i.e. the amount of fish feed required for the cultured fish to support optimal growth without feed wastage) shall be implemented to reduce nutrient enrichment to the surroundings. In addition, this will improve the feed conversion rate for the stock, reduce feed wastage, and mitigate environmental pollution caused by feed residue.

Suitable feeding practices should be adopted to avoid the use of excessive feeds and impact to the seabed under the cages. These practices include:

- Amount of feed given to the fish should be based on biomass of fish contained in the cage and environmental conditions present;
- Feeding should be reduced or stopped during low temperature, low dissolved oxygen, strong currents, or bad weather;
- Feeding operations and fish feeding behaviour should be closely monitored by the operator;
- The use of underwater video cameras to monitor the feeding activity is recommended for all FCZs as far as visibility permits;
- The amount of feed input should be reduced or stopped when changes in fish behaviour (e.g. reduction in feeding rate) are observed;
- Feeding should be conducted in a manner to ensure an even distribution and reduce the amount of wasted feed;
- Detailed records should be kept and provided upon request for each cage. The record should include the amount of feed and type used, estimated number of fish and biomass, water temperature and growth rates, etc. to ensure optimal feed conversion rates could be achieved;
- Size of feed pellets should match the size of fish to ensure that the feed pellets are effectively consumed by the fish stocks; and
- Modern feeding practices and technologies should be used, where practical, to minimise feed wastage and impact to the environment.

Operator and other personnel should take all precautions to reduce spills during delivery of feed to the site. The untaken feeds should be cleaned up immediately to minimise the loss of feed into the adjacent water. Record of the amount of feed delivered to the farm should be kept to monitor feed use during operation. Feeds should be stored in covered areas and should not be left exposed or uncovered to minimise spills and spoilage.

2A.2.2 Fallowing

Fallowing could be conducted by the movement of cages within the licensed area or de-stocking to allow recovery of sediments under the cage and manual recovery of sediments is not required. The movement of stocks to culture tanks or by partial harvesting is another measure to reduce impacts on water or sediment quality from fallowing. The operators should reduce stocking densities by separating cages or selective harvest to allow time for recovery of the surrounding environment.

2A.2.3 Further Engagement in Water Quality Monitoring

In order to further engage mariculturists with monitoring the water quality of the new FCZ, technical seminars and regular farm visits are also held regularly by AFCD to share water quality monitoring and management techniques with fish farmers for the proper use of basic water testing equipment e.g. oxygen meters to encourage proactive management of their fish stocks.