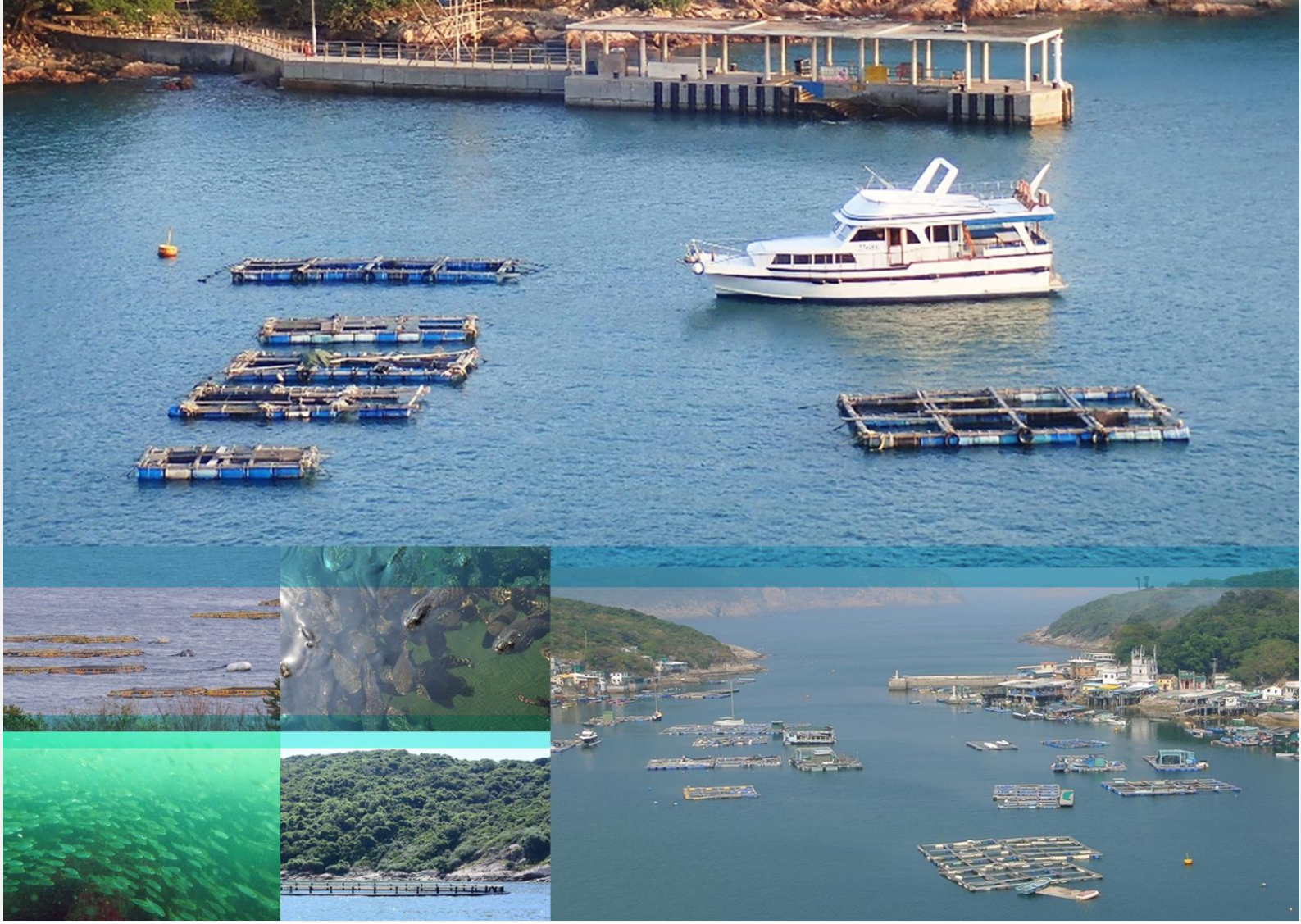

漁農自然護理署
Agriculture, Fisheries and Conservation Department

# Contract Ref.: AFCD/SQ/243/18/C Provision of Services on Desktop Review for Potential New Fish Culture Zones

Project Profile for the Establishment of Fish Culture Zone at Mirs Bay

11 October 2019

Project No.: 0503212

*The business of sustainability*

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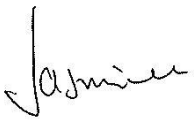
**Signature Page**

11 October 2019

# Contract Ref.: AFCD/SQ/243/18/C Provision of Services on Desktop Review for Potential New Fish Culture Zones

Project Profile for the Establishment of Fish Culture Zone at Mirs Bay



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# 1. INTRODUCTION

## 1.1 Background

Marine fish culture has been an important activity for fisheries production in Hong Kong over decades. In 2010, the Committee on Sustainable Fisheries (CSF), which was established by the Government to study the long-term goals, direction and feasible options for the sustainable development of local fisheries industry, recommended among others that the Government should assist the fisheries industry in developing or switching to modernized and sustainable modes of operation through the provision of technical and financial support. Taking on board the recommendations of CSF and noting the challenges faced by the fisheries industry, it is considered that the industry's future lies not in pursuing an increase in productivity, but in modernizing their operations to enhance efficiency and switching to high value-added operation/products in order to attain a suitable mode of development.

To pave the way for facilitating the sustainable development of the local mariculture sector, the Agriculture, Fisheries and Conservation Department (AFCD) commissioned a consultancy study (1) to explore suitable sites for designation of new fish culture zones (FCZs) in 2014. The study shortlisted six possible sites on the basis of a list of social and environmental criteria with reference to the latest international mariculture practices, and the potential of these sites in accommodating modernized fish farms for culturing in sheltered areas as well as farms adopting more advanced technology for operation in the open sea. Areas that are being planned for development projects and other marine uses (e.g. marine vessel fairways) have been excluded. The carrying capacity of each site has also been evaluated to confirm its environmental sustainability. Relevant stakeholders, including Government bureaux / departments and mariculture representatives, have been consulted to gauge their views on site selection. The mariculture sector in general supported the designation of new FCZs and agreed that the sector should be modernised.

The Chief Executive announced in the 2018 Policy Address that the Government would recommend designating new FCZs at suitable locations, which would create room for the mariculture sector to grow further, including allowing capture fishermen to switch to this sustainable mode of operation, making it possible for the development of newer type of deep-water mariculture in the open sea, and attracting new entrants.

One example of newer type of mariculture is high-density polyethylene (HDPE) cage system (see *Figure 1.1*) that is anti-corrosive, anti-freeze, anti-oxidised, UV-resistant and environmentally friendly. The cage system is widely used in other countries due to the versatility of the materials used and the comparatively limited investment capital required. It can be designed to operate at floating or submersible systems and is able to withstand sea conditions with strong wind, strong wave and strong water currents. It has a long life span of ~15 years without the need of major maintenance. It is also easy to be set up with anchorage system deployed at the corners of the cage, similar to those traditional wooden cages used in the existing FCZs in Hong Kong.

## 1.2 Purpose of this Project Profile

Designation of FCZs of more than 5 hectares in size is classified as a designated project under the Environmental Impact Assessment Ordinance Cap. 499 (EIAO) and therefore a statutory environmental impact assessment (EIA) is required. The purpose of this Project Profile is to facilitate the Director of Environmental Protection to determine the scope of environmental issues to be addressed in the EIA study and hence to issue the EIA Study Brief.

This document includes a description of the potential environmental impacts associated with the construction and operation of a new FCZ at Mirs Bay ("the Project"). The description of the Project presented herein has been based on the best available information compiled by AFCD, and describes

(1) Consultancy Ref. AFCD/FIS/01/14 Consultancy Services for Identification of New Fish Culture Zones in Hong Kong – Feasibility Study

relevant construction activities, and provides operational details and baseline information relating to the conditions at the selected location for the Project, and its surrounding environment.

**Overview of High-Density Polyethylene (HDPE) Cage System**
高密度聚乙烯網箱系統的概觀

(Source: Qingdao Qihang Fishing Cage Co., LTD)

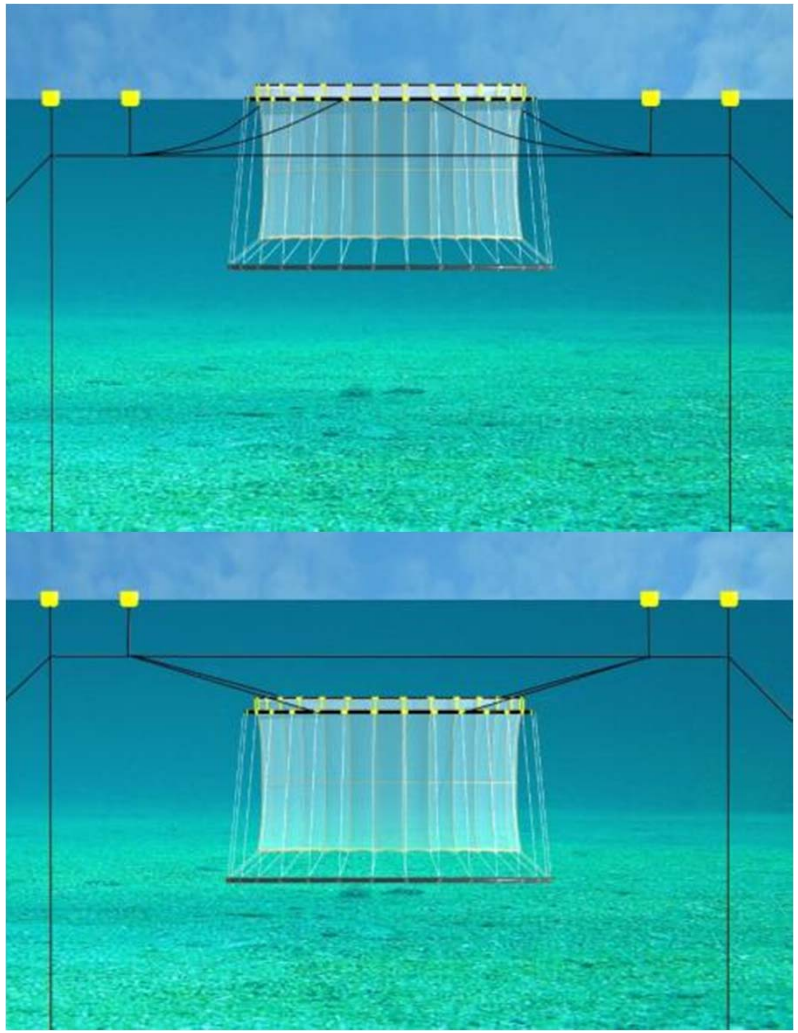

**Illustration of HDPE Floating and Submersible Cage System**
高密度聚乙烯浮式／沉水式網箱系統的展示圖

(Source: https://www.linkedin.com/pulse/offshore-aquaculture-submersible-hdpe-cages-oceanis-1-ciattaglia)

**Figure 1.1**
**圖 1.1**

**Example of Newer Type of Mariculture**
採用新型養殖技術的例子

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# 2. BASIC INFORMATION

## 2.1 Project Title

Establishment of Fish Culture Zone at Mirs Bay (hereinafter named as the "Project").

## 2.2 Name of Project Proponent

Agriculture, Fisheries and Conservation Department (AFCD).

## 2.3 Purpose and Nature of the Project

The Project involves the establishment of a new FCZ at Mirs Bay for fish farmers to operate their fish rafts in the new FCZ. The purpose of the Project is to create room for the mariculture sector to grow further, including allowing capture fishermen to switch to a sustainable mode of operation, making it possible for the development of newer type mariculture, and attracting new entrants.

## 2.4 Location and Scale of the Project and History of Site

The Project site has two main areas, one is located at the waters to the east of Tap Mun (~1,000 m long and ~1,000 m wide; equivalent to ~105 hectares in size) while the other is located at the waters to the east of Ko Lau Wan (~2,000 m long and ~1,500 m wide; equivalent to ~305 hectares in size) (*Figure 2.1*). The FCZ location is shortlisted based on a list of social and environmental criteria with reference to the latest international mariculture practices. In addition, it was refined to avoid the channel between Tap Mun and Ko Lau Wan, minimising potential impacts to marine traffic.

The proposed FCZ at Mirs Bay is approximately 410 hectares in size. The size of licensed raft area within the FCZ will be determined during the EIA stage, taking into account the carrying capacity of the FCZ and the outcome of the water quality impact assessment.

The Project involves the construction and anchorage of fish rafts within the proposed FCZ by fish farmers who obtain marine fish culture licences for this FCZ. After the completion of fish raft construction, fish farmers could operate the fish farm in accordance with the licence requirements and the *Marine Fish Culture Ordinance* (*Cap. 353*).

The Project site is not located within and in the vicinity of historical or existing infrastructure facilities. No historical contamination concern is identified within the Project site.

## 2.5 Number and Types of Designated Projects to be Covered by the Project Profile

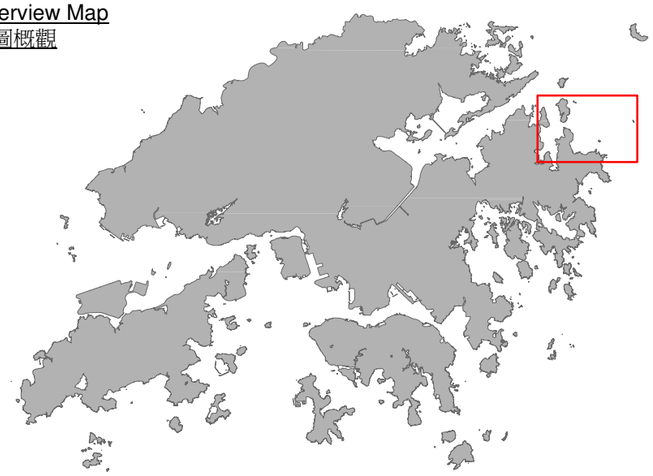
The Project is a designated project under Item M.1(a), Part 1 of Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance:

*"A fish culture zone --- more than 5 ha in size"*

## 2.6 Name and Telephone Number of Contact Person

| **Name, Position & Title** | **Telephone Number** |
|---|---|
| Dr. CHU Chun Wa, Jim<br>*Senior Fisheries Officer (Aquaculture Fisheries)*<br>*Agriculture, Fisheries and Conservation Department* | 2150-7090 |

Overview Map
地圖概觀



Grass Island
塔門

Hoi Ha Wan
海下灣

Hoi Ha
海下

Ko Lau Wan
高流灣

Sai Kung West
Country Park
西貢西郊野公園

Long Harbour
大灘海

Nam She Wan
蚺蛇灣

N

Kilometres 公里

0 1 2

**Legend 圖例**

Proposed FCZ Location
擬議魚類養殖區位置

Figure 2.1
圖 2.1

Location Plan for the Establishment of Fish Culture Zone (FCZ) at Mirs Bay
在大鵬灣設立魚類養殖區的位置圖

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# 3. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

## 3.1 Project Planning and Implementation

The Project Proponent will engage a consultant to undertake the EIA study.

The construction works, which would be mainly the construction and anchorage of fish rafts, will be carried out by the fish farmers who obtain marine fish culture licences in this new FCZ. The culture operation will be regulated under the Marine Fish Culture Ordinance (*Cap. 353*). Maintenance dredging or removal of sediments is not anticipated during FCZ operation under the Project.

## 3.2 Indicative Project Programme

The EIA study is planned to be commenced in the 4$^{th}$ quarter of Year 2019. The planning stage of the Project, including the EIA study, is anticipated to be completed within 18-24 months. Subject to the completion of the EIA study, legislative exercise will be carried out to amend the Schedule to the Fish Culture Zone (Designation) Order (*Cap. 353B*) by negative vetting for designating new FCZ. Consequential amendments to other related ordinances will also be made as necessary. After the designation of the new FCZ, AFCD will grant new marine fish culture licences to the fish farmers for fish raft construction and culture operation in the FCZ.

## 3.3 Interactions with Other Surrounding Projects

No existing or committed projects is identified in the vicinity of the Project site. The Project may have the potential to interact with the proposed establishment of FCZs at Wong Chuk Kok Hoi and Outer Tap Mun, subject to the timing of completion of legislative exercise to amend the Schedule to the Fish Culture Zone (Designation) Order (*Cap. 353B*). Cumulative impacts due to the proposed establishment of FCZs at Wong Chuk Kok Hoi and Outer Tap Mun will be considered during the EIA study and development phase of the Project. The information will be re-examined and confirmed during the EIA Study and the development stage of the Project.

# 4. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

Major environmental elements surrounding the Project are summarised below and are presented in *Figure 4.1*. Potential impacts of the Project on these elements and sensitive receivers as well as their interaction will be examined in the EIA study.

## 4.1 General

The existing land uses in the vicinity of the Project site are generally rural areas. No existing, committed and planned industrial, commercial and residential developments have been identified around the Project site. The nearest village / residential area is located at Ko Lau Wan, which is more than 1,000 m away from the Project site.

Existing subsea utilities and facilities (e.g. cables, pipelines, etc.) are located more than 1,000 m west of the Project site. There is no gazetted beaches in the vicinity of the Project site. The closest non-gazetted beaches at Nam She Wan are located over 400 m away from the Project site. Sai Kung East Country Park is located in the vicinity of the Project site. There are no Sites of Special Scientific Interest (SSSI) in the vicinity of the Project site. The abovementioned environmental elements would not affect the area in which the Project is proposed to be located. The fish culture operation at the existing Kau Lau Wan FCZ might affect water quality of the area in which the Project is proposed to be located and the interaction between the existing and the proposed FCZs will be considered in the EIA study.

## 4.2 Air Quality

The nearest air sensitive receiver (ASR) includes residential area at Ko Lau Wan, which is over 1,000 m from the site.

## 4.3 Noise

The nearest noise sensitive receiver (NSR) includes residential area at Ko Lau Wan, which is over 1,000 m from the site.

## 4.4 Water

The Project may affect a number of water sensitive receivers (WSRs) within and in the vicinity of the Project site. Potential WSRs are:

- Secondary contact recreation subzones, which is located within and in the vicinity of the Project site;
- Non-gazetted beach at Nam She Wan, which is located more than 400 m away;
- Hoi Ha Wan Marine Park and SSSI, which is located more than 4 km away;
- FCZs at Kau Lau Wan and other nearby areas (e.g. Tap Mun, Sham Wan), which are located more than 1,000 m away;
- Ecological habitats for marine organisms including coral communities along the coastal areas of Nam She Wan [(2)]; and
- Fisheries resources and other fisheries sensitive receivers, including artificial reefs at Long Harbour which are located 1,700 m away and nursery ground of commercial fisheries resources.

(2) Some corals were located along the coastal area of Nam She Wan based on initial coral survey as discussed in *Section 4.5*. As mentioned in *Section 5.2*, further investigation of marine ecological habitats will be conducted for the detailed location of coral habitats around the Project site. The locations of the ecological habitats will be presented during EIA stage.

## 4.5 Ecology

Based on a review of desktop information [3][4], coral communities (hard corals, octocorals and black corals) are present at Chek Chau. Initial coral surveys were conducted under the consultancy study AFCD/FIS/01/14 and it was found that coral communities along the coastal areas of Nam She Wan were generally sparse with low cover. There is no terrestrial ecological sensitive receiver within 500 m boundary from the Project site.

## 4.6 Fisheries

Kau Lau Wan FCZ is located at ~1,000 m west of the Project site while other nearby FCZs including Tap Mun and Sham Wan FCZs are located more than 2 km away from the Project site. A total of 33,420 $m^3$ artificial reefs (including biofilters) were deployed at Long Harbour. The Project site is located in the vicinity of the recognized nursery ground of commercial fisheries resources.

Results of the AFCD Port Survey 2016/17 indicated that the Northeast New Territories is one of the key fishing areas with relatively high level of fishing operation and moderate fisheries production.

## 4.7 Cultural Heritage

No declared monuments, government historic buildings, graded or proposed graded historic buildings listed by the Antiquities and Monuments Office (AMO) are located adjacent to the Project site. No Sites of Archaeological Interest recorded by the AMO are located in the vicinity of the Project site. No known marine archaeological potential was identified in the vicinity of the Project site.

## 4.8 Landscape and Visual

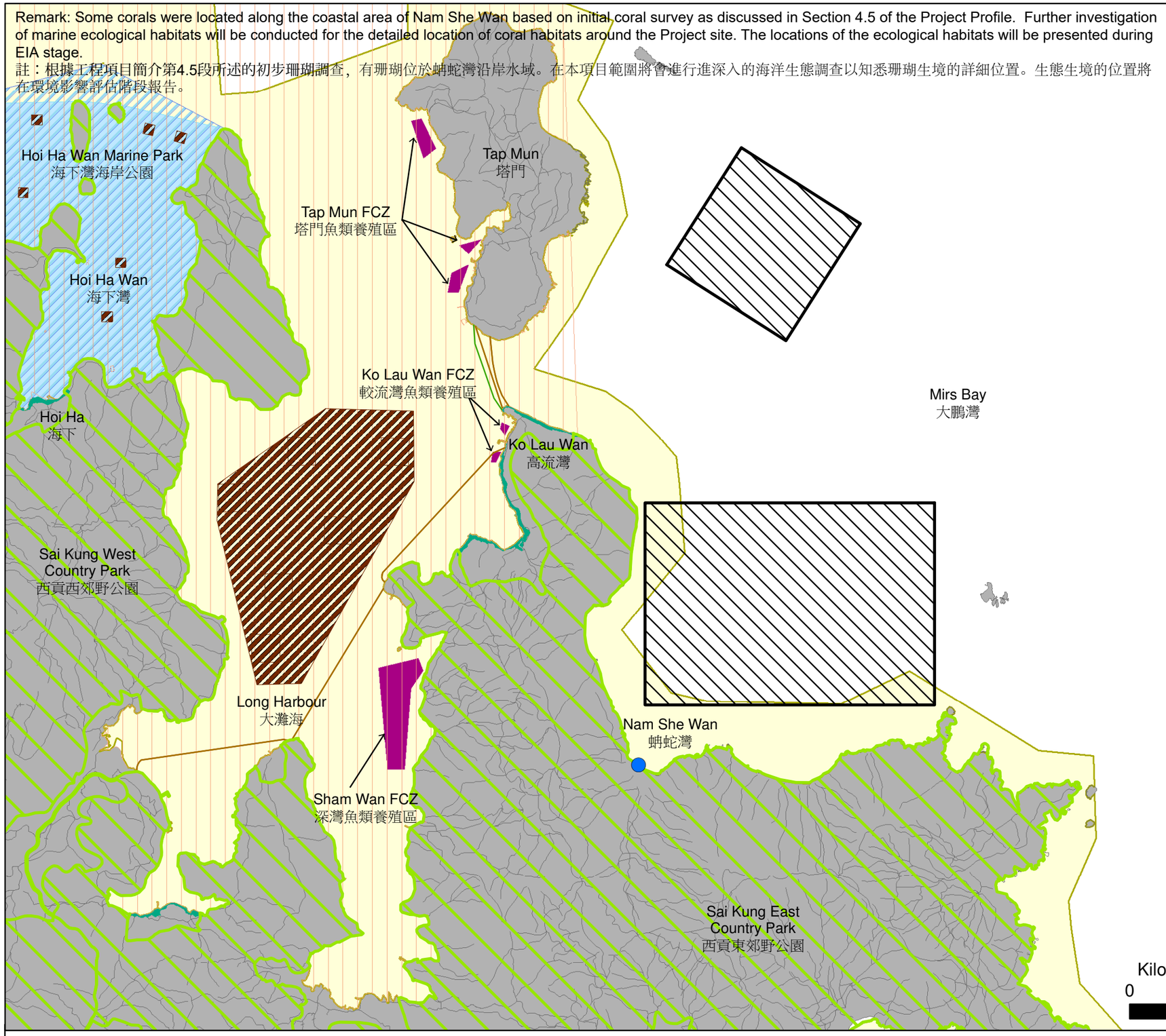
The Project site is adjacent to Tap Mun and Sai Kung East Country Park. Potential visual sensitive receivers would include villagers and tourists from Tap Mun and hikers from Sai Kung East Country Park.

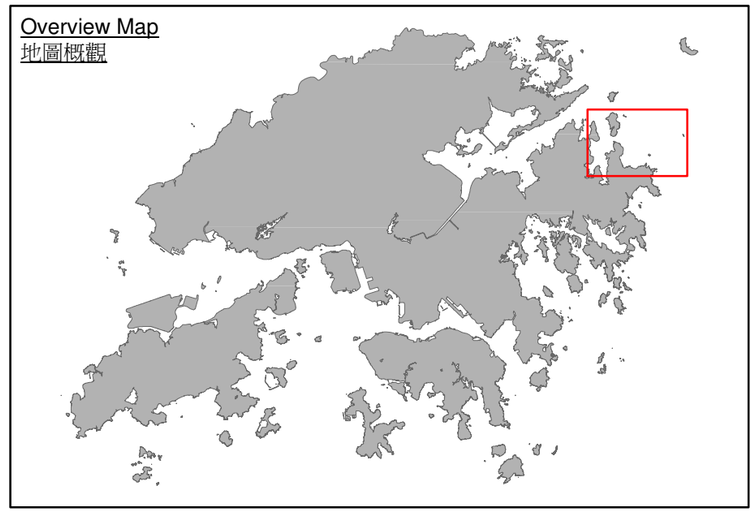
(3) Chan A, Choi C, McCorry D, Chan K, Lee MW, Ang PO (2005) Field Guide to Hard Coral of Hong Kong. Friends of the Country Parks.

(4) Ang PO Jr., Lee MW, Fung HL (2010) Provision of Services on Reference Collection and Study on Octocorals and Black Corals in Hong Kong Waters. Report submitted to Agriculture, Fisheries and Conservation Department.

Remark: Some corals were located along the coastal area of Nam She Wan based on initial coral survey as discussed in Section 4.5 of the Project Profile. Further investigation of marine ecological habitats will be conducted for the detailed location of coral habitats around the Project site. The locations of the ecological habitats will be presented during EIA stage.

註：根據工程項目簡介第4.5段所述的初步珊瑚調查，有珊瑚位於蛇灣沿岸水域。在本項目範圍將會進行進深入的海洋生態調查以知悉珊瑚生境的詳細位置。生態生境的位置將在環境影響評估階段報告。




## Legend 圖例

- Proposed FCZ Location 擬議魚類養殖區位置
- Cable 電纜
- Pipeline 管道
- Country Park 郊野公園
- Gazetted Artificial Reefs 已刊憲的人工魚礁
- Nursery Area of Commercial Fisheries Resources 商業漁業資源育幼區
- Fish Culture Zones 魚類養殖區
- Coastal Protection Area 海濱保護區
- Marine Park 海岸公園
- Sites of Special Scientific Interest 具特殊科學價值地點
- Secondary Contact Recreation Subzone 次級接觸康樂活動分區
- Non-gazetted Beach at Nam She Wan 在蚺蛇灣的非刊憲泳灘

Figure 4.1
圖 4.1

Major Elements of the Surrounding Environment for the Project
本項目周圍環境的主要元素

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Date: 10/10/2019

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# 5. POTENTIAL IMPACTS ON THE ENVIRONMENT

## 5.1 Water Quality

### *5.1.1 Construction*

The construction and anchorage of fish rafts will involve the use of tug boats to tow the fish rafts to the Project site, and no major marine construction works, such as dredging or works with significant seabed disturbance, is expected. The fish rafts will generally be gravity cages and the four corners of each cage will be anchored using weights and ropes and it is expected that the seabed to be disturbed by anchoring will be confined to a thin surface layer (<0.5 m). While anchoring of fish rafts may result in seabed disturbance, the magnitude of disturbance is considered low and temporary. Hence, it is expected that the change in water quality due to seabed disturbance during construction would be minor. As such, no unacceptable water quality impacts are expected during construction stage. All the fish rafts will be floating with permeable cages and have water exchanges with the surrounding water environment. Consequently, no unacceptable changes in hydrodynamics are expected to arise from the presence of the fish rafts at the Project site.

### *5.1.2 Operation*

The potential water quality impacts associated with the Project include changes in water quality due to the operation of the FCZ. It is expected that fish feed wastage (e.g. pellet feed) and fish excretions will be the major waste products and be released into the water body which will affect the water quality around the Project site. Water quality modelling will be carried out during the EIA study to determine the potential impact and demonstrate compliance with relevant Water Quality Objectives (WQO) at sensitive receivers. All fish culture operation will be regulated under the Marine Fish Culture Ordinance (*Cap. 353*) and the number of new licences will be granted in accordance with the carrying capacity of the FCZ to ensure that no unacceptable impact on the marine environment would be resulted.

As mentioned in *Section 3.1*, maintenance dredging or removal of sediments for the Project is not anticipated during FCZ operation under the Project and no water quality impact assessment related to maintenance dredging or removal of sediments is considered necessary under the Project.

## 5.2 Marine Ecology

### *5.2.1 Construction*

As discussed in *Section 5.1.1*, no unacceptable water quality impacts are expected during construction stage. The impacts to marine ecological resources (e.g. coral communities) around the FCZ and the overall functionality of Hoi Ha Wan Marine Park as a result of seabed disturbance and perturbations to water quality due to the works activities (e.g. construction and anchorage of fish raft) are thus anticipated to be minor. No unacceptable marine ecological impacts are expected during construction stage.

### *5.2.2 Operation*

Impacts to marine ecological resources (e.g. coral communities) around the FCZ location as a result of perturbations to water quality during FCZ operation are anticipated. Subject to further investigation of the marine ecological habitats within and in the vicinity of the Project site, the impact to marine ecological resources and the overall functionality of Hoi Ha Wan Marine Park will be assessed and mitigation measures will be recommended as appropriate during the EIA study, taking into account the carrying capacity of the FCZ and the outcome of the water quality impact assessment.

## 5.3 Fisheries

### *5.3.1 Construction*

The Project site is located in the vicinity of the nursery ground for commercial fisheries resources and is located near an existing FCZ at Kau Lau Wan. As discussed in *Section 5.1.1*, no unacceptable water quality impacts are expected during construction stage. The potential direct and indirect impacts including but not limited to water quality and other disturbance to the fisheries resources, artificial reefs in Long Harbour and other fisheries sensitive receivers due to the fish raft construction are thus anticipated to be minor. No unacceptable fisheries impacts are expected during construction stage..

### *5.3.2 Operation*

The Project site is located in the vicinity of the nursery ground for commercial fisheries resources and is located near an existing FCZ at Kau Lau Wan. The fish culture operation at the existing Kau Lau Wan FCZ might affect water quality of the area in which the Project is proposed to be located and the interaction between the existing and the proposed FCZs will be considered in the EIA study. The potential direct and indirect impacts including but not limited to water quality and other disturbance to the fisheries resources, artificial reefs in Long Harbour and other fisheries sensitive receivers due to marine traffic and fish culture operation will be assessed in the EIA study.

## 5.4 Air Quality

### *5.4.1 Construction*

The construction works involve a small number of tug boats or sampans for fish raft construction and anchorage. Some air emissions from plant during construction works is expected; however, due to the small amounts of plants and vessels to be used during construction and large separation distance between the Project site and the ASR, the impacts would be minimal, and well within the relevant standards. No quantitative construction phase assessment is considered necessary.

### *5.4.2 Operation*

During operation, air emissions from generators of the FCZ and a small number of sampans for the transportation of fish farmers are potential sources of air quality impacts. The separation distance between the sources and the ASR is large; therefore no unacceptable adverse air quality impacts is envisaged. No quantitative assessment is considered necessary.

## 5.5 Noise

### *5.5.1 Construction*

The construction works are expected to be conducted within a short period of time with the use of tug boats or sampans which generates minimal noise from the vessel engines. The use of powered mechanical equipment, such as tug boats, is anticipated. However, the nearest NSR is located more than 1,000 m away from the Project site and hence potential construction noise impact is not anticipated.

### *5.5.2 Operation*

During operation, the daily marine fish culture operation is expected to generate minimal noise from the use of sampans, water pumps, air compressors/aerators, diesel generator, etc. Given the nearest NSR is located more than 1,000 m away from the Project site, potential operational noise impact is not anticipated.

## 5.6 Waste Management

No construction and demolition (C&D) materials, sediment, chemical waste will be generated from the construction activities of the Project. General refuse will be generated in limited quantities during construction and operation phases, and normal waste management practices will be implemented.

## 5.7 Cultural Heritage

The Project will not affect any built heritage during the construction and operation phases. Anchoring will be generally conducted at the four corners of each fish raft. It is expected that the seabed to be disturbed by anchoring will be confined to a thin surface layer (<0.5 m) and the magnitude of disturbance is considered as negligible and temporary. However, there is no detailed information about the marine archaeological potential of the project site, a Marine Archaeological Investigation (MAI) as part of the EIA study will be conducted by a marine archaeologist for the project according to the "*Guidelines for Marine Archaeological Investigation*". Baseline review and geophysical surveys will be conducted during the MAI to confirm if there is any marine archaeological potential within the Project site. Should marine archaeological potential be identified, field evaluation programme, such as diver survey, will be conducted by marine archaeologist to assess the marine archaeological impact and mitigation measures, if necessary, would be implemented in prior consultation with AMO. Regarding the field evaluation, the marine archaeologist is required to obtain a licence to excavate and search for antiquities under Antiquities and Monuments Ordinance (Cap. 53).

## 5.8 Landscape and Visual

As there are no vegetation removal and disturbance of existing landscape resources during construction and operation of the Project, impacts on landscape are not expected.

Potential visual impacts from fish raft construction and culture operation to nearby visual sensitive receivers (e.g. villagers, tourists and hikers from Tap Mun and Sai Kung East Country Park) would be assessed in the EIA study.

## 5.9 Terrestrial Ecology

As there will not be any land-based works (including temporary works) under the Project and there is no terrestrial ecological sensitive receiver within 500 m boundary from the Project site, no impacts to terrestrial ecology are thus expected to arise from the construction and operation of this Project.

## 5.10 Land Contamination

As the Project does not involve any works area on land and dredging activities are not anticipated for the Project, potential land contamination within the Project site is not anticipated.

## 5.11 Hazard to Life

The Project would not involve the use of any dangerous goods and there is no store of dangerous goods in the vicinity of the Project site. Hazard to life arising from the construction or operation of the Project is not anticipated.

## 5.12 Cumulative Impacts

Cumulative impacts due to other existing, planned or committed concurrent projects, including the proposed establishment of FCZ at Outer Tap Mun, will be considered during the EIA study and development phase of the Project. The assessment of any impacts will be based on the best publicly available information at the time of carrying out the EIA study.

# 6. ENVIRONMENTAL PROTECTION MEASURES TO BE INCORPORATED IN THE DESIGN AND FURTHER ENVIRONMENTAL IMPLICATIONS

## 6.1 Construction Phase

During fish raft construction and anchorage, the following good site practices are recommended to be implemented as far as practicable:

- The number of vessels operating concurrently should be limited as far as practicable;
- All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;
- All noisy equipment within the vessel shall comply with the relevant noise emission standard under Noise Control Ordinance;
- Fish raft construction should not cause foam, oil, grease, scum, litter or other objectionable matter on the water;
- No sewage effluent should be discharged into the water environment. Appropriate numbers of portable chemical toilets shall be provided by a licensed contractor as necessary to serve the workers. The fish farmers shall also be responsible for waste disposal and maintenance practices;
- The vessels should be sited as far away from nearby ASRs and NSRs as possible; and
- Appropriate good site practices on noise control (e.g. addition of noise barrier/enclosure) shall be adopted to reduce noise generated from the vessel to minimise potential disturbance to nearby NSRs.

Practical measures taken to minimise impacts to water quality would prevent subsequent impacts to marine ecological and fisheries resources. It is acknowledged that measures recommended to control water quality impacts to within acceptable levels are also expected to control impacts to ecological and fisheries resources.

It is expected that an Environmental Monitoring and Audit (EM&A) programme will be required to monitor impacts to water quality during construction phase. This monitoring programme would be able to confirm that the necessary mitigation measures are being implemented and that impacts are within acceptable levels. Should unacceptable impacts be detected, the EM&A programme would serve to trigger additional measures.

## 6.2 Operation Phase

Maintaining a good mariculture environment is key to ensuring sustainable utilisation of FCZs and successful rearing of healthy and high quality fish during culture operation. Good management measures should be put into place to reduce diseases and kills as well as to mitigate pollution of the aquaculture environment. Good mariculture practices include adequate precautions, monitoring and contingency response. The prime objective is to regulate disadvantages conditions like increasing organic matters, low dissolved oxygen level and high bacterial content in the water body. The mariculturists are suggested to follow the ten good mariculture practices recommended by the AFCD [(5)] which are summarised and briefly described as follows:

1. Maintain appropriate stocking density
    - Check the growth rate of fish and sort them into different cages according to their size to reduce stocking density.
    - Use the “Appropriate culture density chart” to estimate the appropriate density.

(5) AFCD (2009) Environmental Management of Aquaculture. Good Aquaculture Practice Series 2. 32pp.

2. Remove fouling organisms on the fish cages regularly
    - Clean fish nets regularly to prevent deposit of fouling organisms which will affect sea current exchange.
    - Inspect fish nets regularly and repair any torn or damaged parts.
3. Good feeding management measures
    - Use dry pellet feed instead of trash fish to reduce the content of organic matters in water.
    - Apply feed in phases and in appropriate quantities. Stop feeding if fish are not eating to avoid water pollution by residual fish feed.
4. Proper disposal of dead fish and garbage
    - Remove all rubbish, residual feed and fish carcasses on the water surface and put them in a rubbish bin with lid to avoid water contamination and spreading of germs.
    - Dead fish should be collected immediately and put in a garbage bag for delivery to the nearest refuse collection point.
    - In the event of extensive fish kill, seek assistance from the AFCD or the Marine Department.
5. Regular disinfection of fish culture gears
    - Disinfect fish culture gears thoroughly and regularly by bleaching, streaming and drying them under strong sunlight.
6. Quarantine for newly stocked fish/fry
    - New adult fish and fry should be isolated for a few days to observe their health condition. If abnormal behaviour or infection symptoms are detected, isolate and disinfect immediately.
7. Isolation/proper treatment of sick fish
    - Any fish infected must be isolated immediately for proper treatment or to be destroyed.
    - Use fish drugs prescribed by the AFCD or a registered veterinarian.
8. Proper use of feed additives and drugs
    - Apply feed additives and drugs as instructed by the registered veterinarian.
9. Regular monitoring of water quality and fish health
    - Carry out a simple health check on the fish regularly. The fish will be checked for their feed intake and movement as well as their body surface, fins and gills for parasites or disease symptoms.
    - Measure water quality parameters at specified times regularly. These parameters vary in different seasons across waters where marine fish culture zones are situated. Unless in special conditions (e.g. stagnation or cold current), water quality parameters of FCZs should generally remain with the following ranges most of the time as shown in *Table 6.1*. Additional monitoring should also be carried out when there are sudden weather changes or extend cloudy periods.

**Table 6.1 Recommended Ranges of Water Quality Parameters**

| Water quality parameters | General range | Testing tool |
|---|---|---|
| Dissolved oxygen | 4-8 mg/L | Dissolved oxygen meter |
| Water temperature | 18-28°C | Thermometer |
| pH | 7.9-8.3 | pH meter / litmus paper |
| Salinity | 25-34 ppt | Salinity refractometer |

In case of exceedances or change in the water quality parameters, the following actions should be considered:

- When seawater pH is low, reduce feeding frequency and quantity or even stop feeding.
- Monitor dissolved oxygen levels more closely if suspect any changes or when there are sudden weather changes or extend cloudy periods.
- When dissolved oxygen level is low, stop feeding, reduce the stocking density and turn on an aerator or jet water along the borders of rafts with a blast pump to boost dissolved oxygen.
- Select fish species that can adapt to local climate.
- Feed sparingly and add sun screens to reduce direct sunlight.
- When water temperature is too low, the fish should not be relocated frequently.
- Depending on the temperature tolerance range of fish species under culture, harvest before the onset of winter or before water temperature drops whenever possible.
- Stay alert to water temperature changes. If it falls below 18°C, monitor fish activities closely. Sell the fish stock if possible.
- Highly nutritious feed must be given to prepare fish for winter. Add vitamins C and E appropriately to boost immunity and cold tolerance.

10. Maintenance of farm management records

- Fish farmers should get a good habit of keeping records of weather, feeding quantities, water temperature, dissolved oxygen level and fish activities. These records provide useful information for analysis thus provide a suitable management solution to enhance culture efficiency.

Apart from adopting the good mariculture practices mentioned above, a range of environmental enhancement measures such as deploying biofilters at suitable locations, controlling the use of trash fish, mandating fallowing etc may be introduced for the Project to enhance environmental sustainability.

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

## 6.3 Potential Severity, Distribution and Duration of Environmental Effects

Water quality, marine ecology and fisheries are potential issues during the operation of the FCZ. The possible severity, distribution and duration of environmental effects such as beneficial and adverse effects; short and long term effects; secondary and induced effects; cumulative effects will be considered and addressed in the EIA, where applicable.

With the implementation of appropriate mitigation measures, no unacceptable impacts are expected. This will be confirmed in the EIA study.

## 6.4 Beneficial Effects

During the design phase of the Project, the scale of the operation will be recommended based on results of modelling with the primary objective to ensuring that the culture density is below the carrying capacity of the FCZ. This is considered as an environmentally friendly design which would be beneficial to the aquaculture and marine environment by improving the culture environment and sustaining water quality in the vicinity.

For the fish raft construction, environmental protection measures are recommended to alleviate potential environmental impacts. These measures are considered as good practices related to mitigation of air quality, noise, water quality and waste management issues of the Project.

During operation of the FCZ, it is suggested that the mariculturists should follow the ten good mariculture practices recommended by the AFCD [6] which would allow for the maintenance of a sustainable culture environment.

Overall, with the adoption of the above environmentally friendly design and environmental protection measures, it is expected that the Project will be beneficial to the aquaculture environment without causing any unacceptable impacts to the surrounding environment.

(6) AFCD (2009) *Op. cit.*

# 7. USE OF PREVIOUSLY APPROVED EIA REPORTS

No previously approved EIA reports are referred to in the preparation of this Project Profile.