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ACE-EIA Paper 1/2023
For advice on 13 February 2023

Environmental Impact Assessment Ordinance (Cap. 499)
Environmental Impact Assessment Report

Establishment of Fish Culture Zones at Wong Chuk Kok Hoi, Outer Tap Mun, Mirs Bay, and Po Toi (Southeast)

PURPOSE

This paper presents the key findings and recommendations of the following four Environmental Impact Assessment (EIA) reports submitted under Section 6(2) of the Environmental Impact Assessment Ordinance (EIAO) (hereafter collectively known as "the Projects"):

(i) Establishment of Fish Culture Zone at Wong Chuk Kok Hoi (Application No.: EIA-288/2022);
(ii) Establishment of Fish Culture Zone at Outer Tap Mun (Application No.: EIA-289/2022);
(iii) Establishment of Fish Culture Zone at Mirs Bay (Application No.: EIA-290/2022); and
(iv) Establishment of Fish Culture Zone at Po Toi (Southeast) (Application No.: EIA-291/2022).

The Agriculture, Fisheries and Conservation Department (AFCD) ("the Applicant") and its consultants will present the reports at the meeting of the EIA Subcommittee.

ADVICE SOUGHT

2. Members' views are sought on the findings and recommendations of the above EIA reports. The Director of Environmental Protection (DEP) will take into account the comments from the public and the Advisory Council on the Environment (ACE) in deciding whether or not to approve the EIA reports under Section 8(3) of the EIAO.

BACKGROUND

3. The Government has been supporting the modernisation and sustainable development of local fisheries industry to enhance its competitiveness. The Committee on Sustainable Fisheries (CSF) recommended in 2010 that mariculture was considered as a practical alternative to capture fisheries. Further to AFCD's study and consultation with relevant stakeholders since 2014, in the 2018 Policy Address, the Chief Executive announced the recommendation of designating new Fish Culture Zones (FCZs) at suitable locations to create room for growth of mariculture sector. Open seas at Wong Chuk Kok Hoi (WCKH), Outer Tap Mun (OTM), Mirs Bay (MB) and Po Toi (Southeast) (PT(SE)) were identified to be suitable for establishment of FCZs with modernised deep water mariculture operation.

4. The Applicant submitted the EIA reports for the Projects for approval under the EIAO on 18 October 2022. The DEP, in consultation with relevant authorities, considered that the EIA reports have met the requirements in the respective EIA Study Briefs and the Technical Memorandum on EIA Process (TM), for the purpose of their public inspection under Section 7(4) of the EIAO on 16 November 2022.

NEED FOR THE PROJECT

5. There has been a moratorium on designation of new FCZs and issuance of new marine fish culture licences since 1990 due to the then rising concern on the degradation of water quality and marine environment in the vicinity of existing FCZs with the use of polluting feeds and over-stocking of fish, etc. from traditional mariculture activities. Without the establishment of new FCZs, the development of mariculture sector would only rely on the existing FCZs, which have limited capacity to develop into a modernised and sustainable mode of mariculture operation. It will be challenging for mariculturists to invest and diversify if mariculture production continues to decline in quality and quantity, which will eventually halt the development of the fisheries industry.

ENVIRONMENTAL BENEFITS

6. According to the EIA reports, the Projects will bring the following potential environmental benefits -

(i) **Promote sustainable mariculture development**: The establishment of new FCZs would provide an alternative for capture fishermen to switch to a sustainable mode of operation, which would alleviate the local fishing pressure and promote recovery of natural fisheries resources and marine environment.

(ii) **Use of modern mariculture technologies**: Use of advanced and highly automated technologies (e.g. real-time surveillance, automated fish feeder, and renewable energy) could reduce labour intensive activities, hence reduce potential disturbance to ecology and marine environment from feed wastage, workforce wastes, and marine vessel traffic, etc.

(iii) **Develop advanced mariculture operation in deep waters:** Deep water environment with ample water circulation and sufficient separation distance from seabed would prevent accumulation of organic content and avoid the need for regular maintenance dredging, and thereby minimise the potential water quality and marine ecological impacts.

(iv) **Use of modern fish cage design**: Fish cages with weather resilient and durable design could also reduce the chance of fish rafts/cages damage and thereby minimise the potential impacts on marine ecology and fisheries due to fish loss/escape. Besides, new fish farm structures would also provide artificial substrates and serve as marine habitats bringing potential beneficial to marine ecological resources.

DESCRIPTION OF THE PROJECT

7. The Projects are to establish FCZs at WCKH, OTM, MB and PT(SE) with a total size of about 600 hectares (ha) and carrying capacity[1] of 8,900 tonnes for mariculturists to construct fish farm structures and operate mariculture activities to facilitate sustainable development of local mariculture sector. The proposed size and carrying capacity of the four FCZs are detailed in **Table 1**. The layout plans of the Projects are shown in **Figures 1 to 5**.

[1] Carrying capacity is defined as the maximum standing fish stock (i.e. amount of biomass of fish being kept on site) of a FCZ without significant deterioration of water quality under the typical average condition.

Table 1: Approximate Size and Carrying Capacity of the Four Proposed FCZs

Location	Size (ha)	Carrying Capacity (ton)
Wong Chuk Kok Hoi	35	755.2
Outer Tap Mun	55	684.5
Mirs Bay	410	5,683.5
Po Toi (Southeast)	100	1,765.4
Total	**600**	**8,888.6**

8. The scope of the Projects involves -

(i) Off-site prefabrication, assembly and anchorage of fish farm structures including fish rafts/cages, auxiliary facilities and mooring system within the Project sites; and

(ii) Operation of mariculture activities within the Project sites including management of fish stocks and fish rafts/cages, transportation of fish stocks, fish feeds and equipment, etc.

9. To avoid degradation of water quality and marine environment arising from over-stocking and polluting fish feeds as from traditional mariculture activities, the Projects will be operated within the proposed carrying capacity[2] to limit the potential changes in water quality due to operation of mariculture activities and pellet feed will be used to minimise the generation of organic waste. Meanwhile, highly automated mode of mariculture operation will be adopted to minimise waste and discharges generated from the workforce and frequency of marine traffic.

10. Besides, the Projects would not involve any dredging operations or sediment removal during construction and operation phases, and would not require any land-based works, structures or activities.

11. Construction of fish farm structures are anticipated to commence in 2024, with a duration of typically a few weeks to complete for each set of fish farm structures. Operation of mariculture activities are anticipated to commence upon completion of construction of individual set of fish farm structures.

[2] The optimal carrying capacity for each of the FCZs was derived from the assessment by a 3-dimensional hydrodynamic and water quality computer modelling system under the EIA studies, taking into account the regional and local water quality influencing factors.

12. The Projects are designated project by virtue of Item M.1(a), Part I, Schedule 2 of the EIAO, which specifies "A fish culture zone more than 5 ha in size".

CONSIDERATION OF ALTERNATIVE OPTIONS

13. The EIA reports have considered different alternative options for the Projects. The recommended options have taken into account site constraints and environmental considerations to avoid or minimise environmental impacts in terms of water quality, marine ecology, fisheries and waste management aspects. The key considerations are summarised below -

(i) **Development options:** Establishing the new FCZs in deeper waters with high water flushing rate, instead of expanding the existing FCZs in shallow waters, to allow adequate water dispersion which would avoid the accumulation of organic content and degradation of nearby marine environment, as well as the need for maintenance dredging during operation of the Projects.

(ii) **Project siting**: Selecting the project locations to avoid encroachment on important marine ecological sensitive areas such as marine parks and marine reserves, sites of special scientific interest (SSSI), coral communities, coastal protection areas, etc.

(iii) **Project size**: Establishing smaller FCZs at different locations, instead of a single larger FCZ, to avoid concentrating the organic loading at a single site to minimise impacts to nearby marine ecological habitats and fisheries resources.

(iv) **Design**: Adopting modernised fish farm designs and advanced mariculture technologies with durable and weather-resistant materials, instead of traditional design with timber and floating units made of plastic drums/polystyrene foams, to minimise the potential impacts on marine ecology and fisheries such as potential fish loss/escape and introduction of invasive species due to fish rafts/cages damage.

(v) **Fish feed**: Adopting pellet feed, instead of more polluting fish feed such as trash fish, to reduce the amount of uneaten fish feed from mariculture operation and thereby minimise the potential water quality impacts due to increase in pollution loads from feed wastage.

(vi) **Construction method**: Adopting off-site prefabricated fish structures to reduce on-site construction activities and to minimise the potential water quality and marine ecological impacts and waste generation during the construction phase of the Projects. The time for construction of each fish farm structures will be completed within a few weeks to minimise the duration of environmental disturbances.

SPECIFIC ENVIRONMENTAL ASPECTS TO HIGHLIGHT

14. The major aspects of environmental impacts arising from the Projects include water quality, marine ecology and cultural heritage. With suitable mitigation measures in place, no adverse environmental impact is anticipated. Specific environmental aspects of the four Projects are highlighted in **Annexes 1 to 4**.

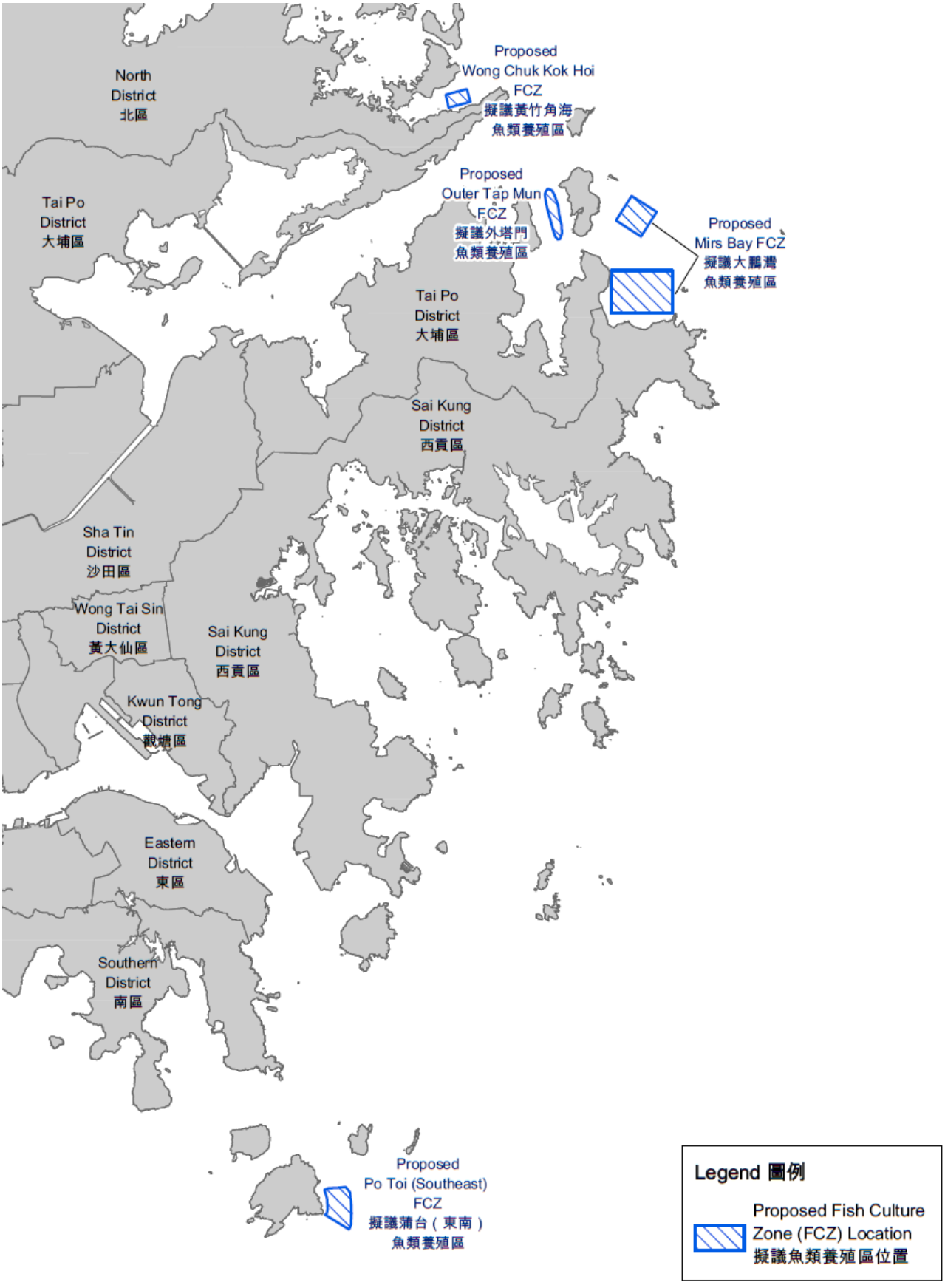
ENVIRONMENTAL MONITORING AND AUDIT

15. The EIA report of the Projects has included an Environmental Monitoring and Audit (EM&A) Manual, which recommends an EM&A programme during the construction and operation phases of the Project. Water quality monitoring is the key aspect of the recommended EM&A requirements.

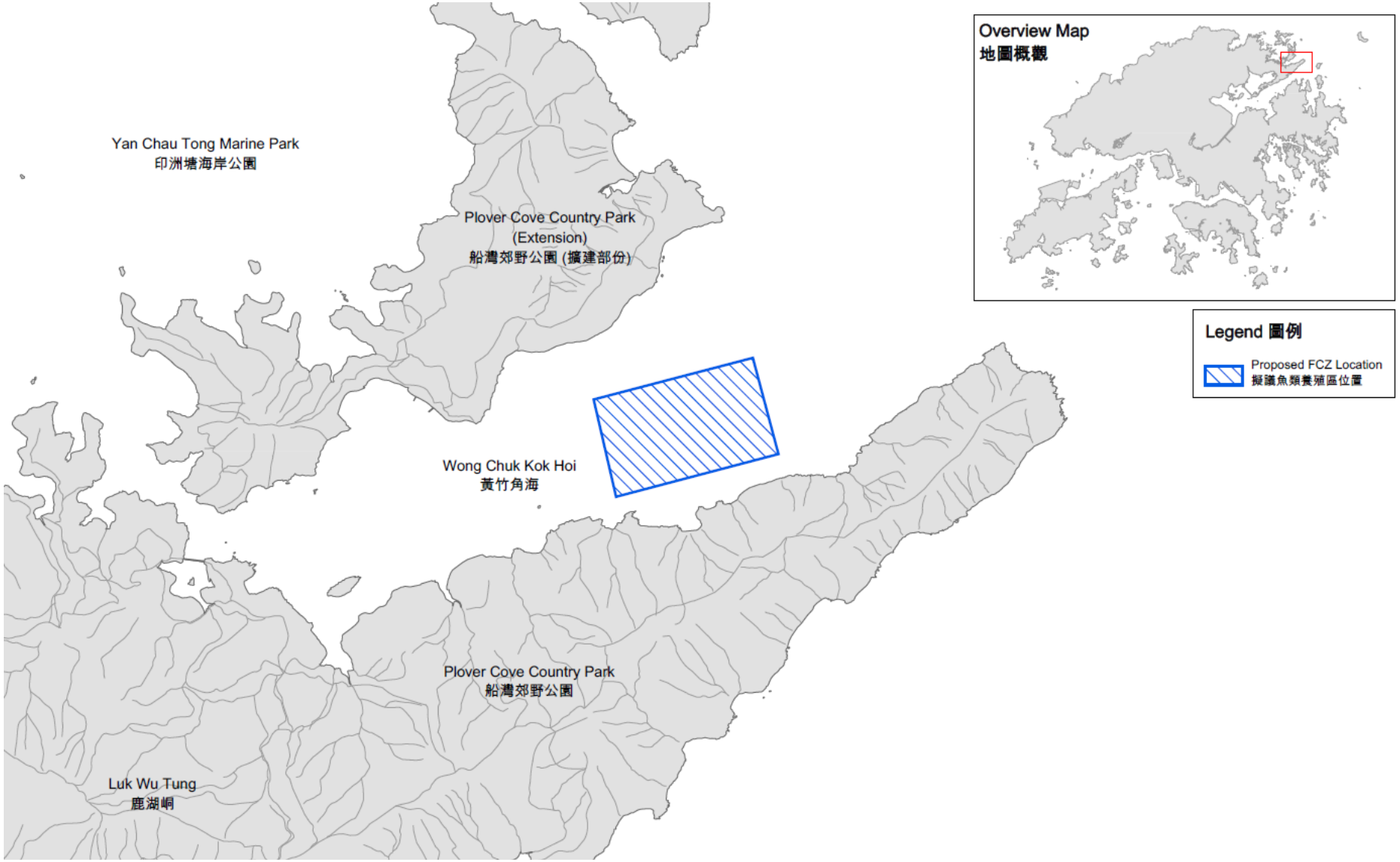
PUBLIC CONSULTATION

16. The Applicant has made the EIA report, EM&A Manual and Executive Summary of the Projects available for public inspection under the EIAO from 29 November to 28 December 2022. During the inspection period, a total of 10 sets of public comments were received by the Environmental Protection Department (EPD) for the Projects. A summary of public comments received by EPD for the Projects during the public inspection period and a gist of the main concerns raised in the public comments will be provided separately.

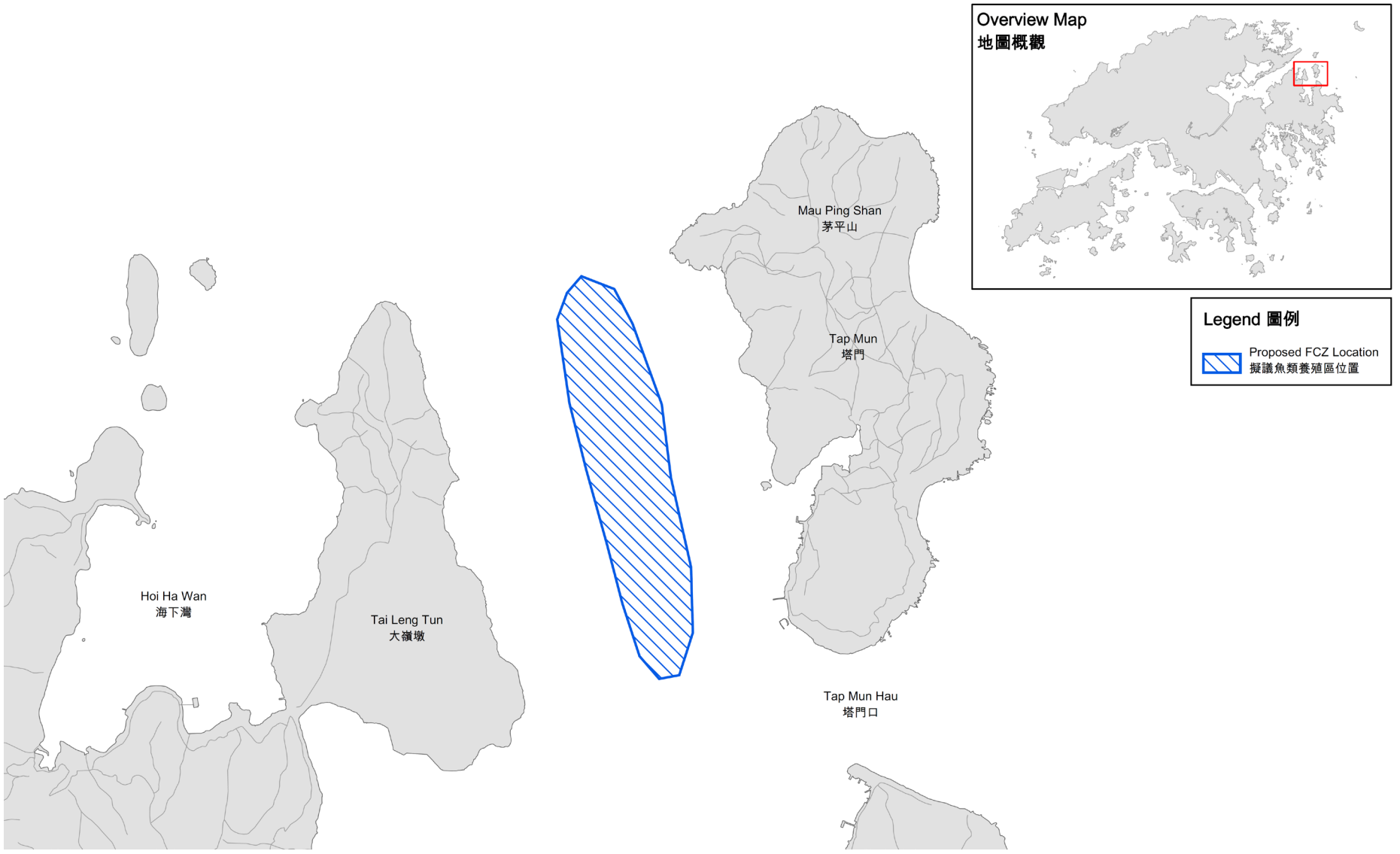
January 2023
Environmental Assessment Division
Environmental Protection Department



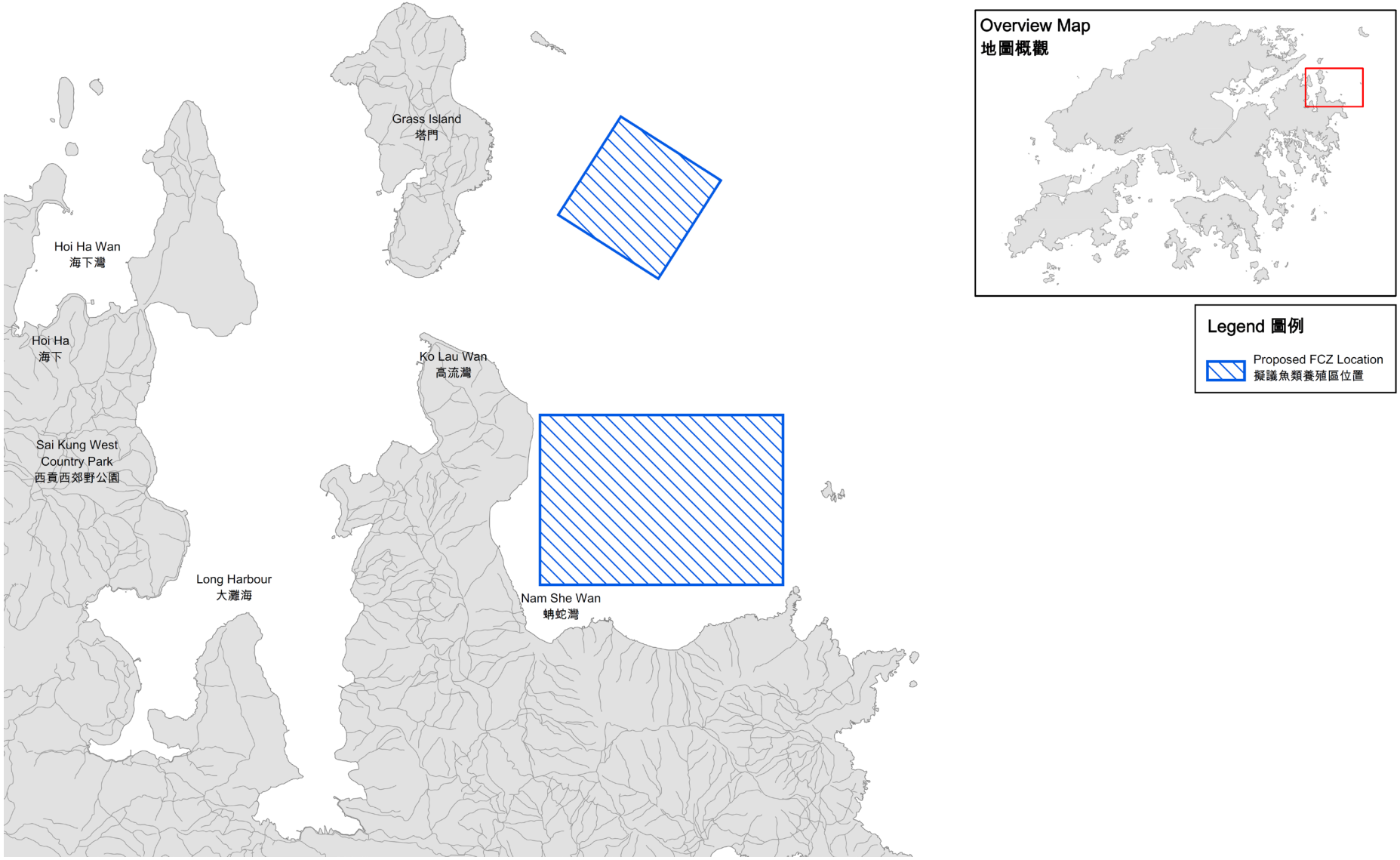
Project Title:	**Establishment of Fish Culture Zones**	**EIA Application Nos.:** **EIA–288/2022 to EIA–291/2022**	
Figure 1	**Project Location Plan** [Remarks: This figure is prepared based on Figure 2.2 of the EIA Executive Summary]		



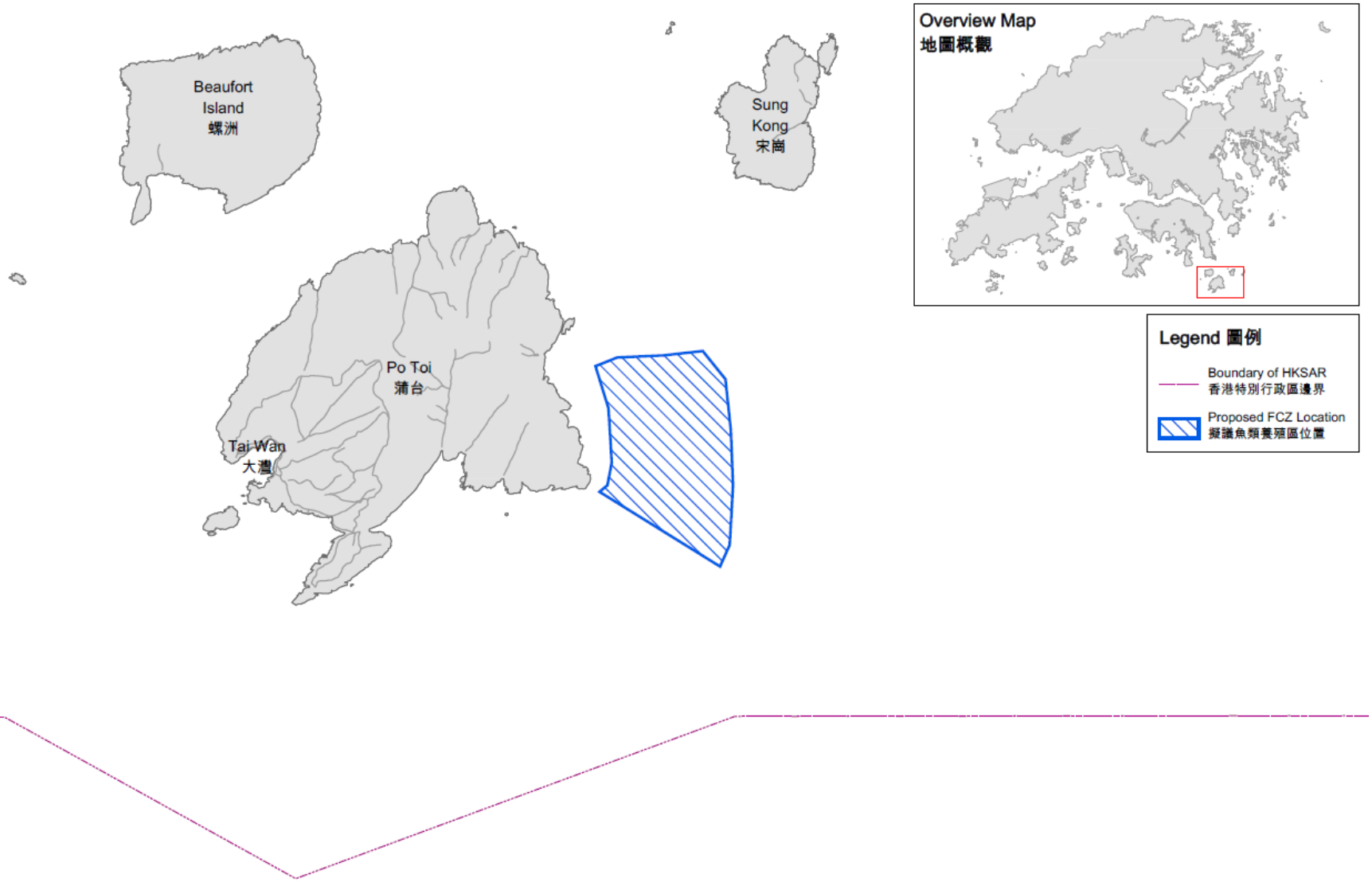
Project Title:	**Establishment of Fish Culture Zone at Wong Chuk Kok Hoi**	**EIA Application No.:**	
Figure 2	**Project Location Plan** [Remarks: This figure is prepared based on Figure 1.1 of the EIA Executive Summary]	**EIA–288/2022**	



Project Title:	**Establishment of Fish Culture Zone at Outer Tap Mun**	**EIA Application No.:** **EIA–289/2022**	
Figure 3	**Project Location Plan** [Remarks: This figure is prepared based on Figure 1.1 of the EIA Executive Summary]		



Project Title:	**Establishment of Fish Culture Zone at Mirs Bay**	**EIA Application No.:** **EIA–290/2022**	
Figure 4	**Project Location Plan** [Remarks: This figure is prepared based on Figure 1.1 of the EIA Executive Summary]		



Project Title:	**Establishment of Fish Culture Zone at Po Toi (Southeast)**	**EIA Application No.:** **EIA–291/2022**	
Figure 5	**Project Location Plan** [Remarks: This figure is prepared based on Figure 1.1 of the EIA Executive Summary]		

SPECIFIC ENVIRONMENTAL ASPECTS

Fish Culture Zone at Wong Chuk Kok Hoi

1. The key affected environmental sensitive receivers identified within and in the vicinity of the Project include recreational areas in Tolo Harbour and Channel Water Control Zone, existing FCZs at Wong Wan, O Pui Tong, etc., proposed FCZs at WCKH, OTM and MB, marine parks, corals, mangroves, etc. No air sensitive receivers were identified within the assessment area of the Project.

Water Quality

2. Quantitative water quality impact assessment has been conducted to assess the potential change in water quality at the water sensitive receivers (WSRs) of the Project due to operation of mariculture activities. Most of the WSRs could fully comply with the criteria of relevant Water Quality Objectives (WQOs) except there are relatively low values of 10^{th} percentile depth-average dissolved oxygen (DO) for the Project site itself and the existing O Pui Tong FCZ, which is about 4 km away from the Project site.

3. For the Project site, the 10^{th} percentile depth-average DO level normally complies with the criteria stipulated in the WQOs except for some occasions, where exceedance may occur in the surface level during the summer period mainly due to higher water temperature and stratification. With mitigation measures (i.e. artificial aeration) in place, the 10^{th} Percentile DO values within the proposed Project site will be 4.0 mg/L which would not cause any notable impact to mariculture operation in general, based on the advice of AFCD. As for O Pui Tong FCZ, the predicted DO exceedance is due to background contribution and there is no predicted DO deterioration during operation of the Project.

4. Meanwhile, other potential water quality impacts such as change in hydrology and flow regime, spillage of fish drugs, pharmaceutical chemicals and feed, wastewater from mariculture operation, etc., have also been considered.

5. With the implementation of preventive and recommended mitigation measures including control of standing stock level to within the proposed carrying capacity, sufficient separation of fish rafts/cages, mandatory use of pellet feed, artificial aeration and operational measures and best practices for mariculture activities under *Marine Fish Culture Ordinance (Cap. 353)* and use of fish drugs under *Veterinary Surgeon Registration Ordinance (Cap. 529)*, no unacceptable water quality impacts due to operation of the Project are anticipated.

Cultural Heritage

6. The EIA report has identified a sonar contact (i.e. A-SC001) on the seabed within the Project site that may be of marine archaeological potential. In view of the muddy/silty seabed nature and its shallow deposition on the seabed, the sonar contact is likely to be a modern and recently deposited debris that would not be of high archaeological potential.

7. Nevertheless, a buffer area of 20 m radius from the sonar contact is recommended to avoid any anchoring activities in the area. With the implementation of recommended preventive measures, no unacceptable cultural heritage impacts due to construction and operation phases of the Project are anticipated.

Other Environmental Impacts

8. Other environmental impacts including aspects of marine ecology, fisheries, noise, waste management, landscape and visual impacts have been satisfactorily addressed in the EIA report and no adverse environmental impacts are anticipated. With the implementation of the recommended mitigation measures, the Project will comply with the relevant requirements of the EIA Study Brief and TM.

SPECIFIC ENVIRONMENTAL ASPECTS

Fish Culture Zone at Outer Tap Mun

1. The key affected environmental sensitive receivers identified within and in the vicinity of the Project include Hoi Ha Wan (HHW) Site of Special Scientific Interest, HHW Marine Park, existing and proposed FCZs including WCKH FCZ, coral communities, spawning ground and nursery area of commercial fisheries resources, etc. No noise sensitive receivers were identified within the assessment area of the Project.

Water Quality

2. Quantitative water quality impact assessment has been conducted to assess the potential change in water quality at WSRs of the Project due to operation of mariculture activities. It is predicted that the WQO criteria would be complied with for all WSRs except for the proposed WCKH FCZ, which the dissolved oxygen level is the same under the baseline scenario and with Project scenario (please refer to **Annex 1** for details). Besides, other potential water quality impacts such as change in hydrology and flow regime, spillage of fish drugs, pharmaceutical chemicals and feed, wastewater from mariculture operation, etc. have also been considered.

3. With the implementation of recommended preventive and mitigation measures including control of standing stock level to within the proposed carrying capacity, sufficient separation of fish rafts/cages, mandatory use of pellet feed, and operational measures and best practices for mariculture activities under *Marine Fish Culture Ordinance (Cap. 353)* and use of fish drugs under *Veterinary Surgeon Registration Ordinance (Cap. 529)*, no unacceptable water quality impacts due to operation of the Project are anticipated.

Cultural Heritage

4. The EIA report has identified three sonar contacts (i.e. B-SC001, B-SC011, and B-SC021) on the seabed within the Project site that may be of marine

archaeological potential. In view of the muddy/silty seabed nature and their shallow deposition on the seabed, the sonar contacts are likely to be a modern and recently deposited debris that would not be of high archaeological potential.

5. Nevertheless, a buffer area of 20 m radius from the sonar contacts is recommended to avoid any anchoring activities in the area. With the implementation of recommended preventative measures, no unacceptable cultural heritage impacts due to construction and operation of the Project are anticipated.

Other Environmental Impacts

6. Other environmental impacts including aspects of air quality, marine ecology, fisheries, visual impacts and waste management have been satisfactorily addressed in the EIA report and no adverse environmental impacts are anticipated. With the implementation of the recommended preventative and mitigation measures, the Project will comply with the relevant requirements of the EIA Study Brief and TM.

SPECIFIC ENVIRONMENTAL ASPECTS

Fish Culture Zone at Mirs Bay

1. The key affected environmental sensitive receivers identified within and in the vicinity of the Project include HHW Site of Special Scientific Interest, HHW Marine Park, existing and proposed FCZs, coral communities and amphioxus habitat, spawning ground and nursery area of commercial fisheries resources, etc.

Water Quality

2. Quantitative water quality impact assessment has been conducted to assess the potential change in water quality at WSRs of the Project due to operation of mariculture activities. It is predicted that the WQO criteria would be complied with for all WSRs except for the proposed WCKH FCZ, which the dissolved oxygen level is the same under the baseline scenario and with Project scenario (please refer to **Annex 1** for details). Besides, other potential water quality impacts such as change in hydrology and flow regime, spillage of fish drugs, pharmaceutical chemicals and feed, wastewater from mariculture operation, etc. have also been considered.

3. With the implementation of recommended preventive and mitigation measures including control of standing stock level within the proposed carrying capacity, sufficient separation of fish rafts/cages, mandatory use of pellet feed, and operational measures and best practices for mariculture activities under *Marine Fish Culture Ordinance (Cap. 353)* and use of fish drugs under *Veterinary Surgeon Registration Ordinance (Cap. 529)*, no unacceptable water quality impacts due to operation of the Project are anticipated.

Marine Ecology

4. A small extent of amphioxus habitat is identified within the Project site. Nevertheless, since typical amphioxus habitats (i.e. shallow and subtidal sand flats) are recorded in other locations in the eastern waters in Hong Kong,

the small extent of amphioxus habitat with muddy and silty seabed in deep water within the Project site is not considered an important recruitment area and spawning ground for amphioxus. In addition, given the temporary nature of the construction activities, limited disturbance to small fraction of water column/extent of surface layer of seabed, and infrequent marine vessel traffic, unacceptable impacts due to habitat disturbance are not anticipated.

5. Notwithstanding the above, preventive measures such as avoidance zone for construction and operation works were recommended to further minimise the potential disturbance to the amphioxus habitat identified within the Project. The EIA Study concluded that with the preventive and mitigation measures in place, no unacceptable impacts to marine ecological resources are anticipated.

Cultural Heritage

6. The EIA report has identified a sonar contact (i.e. C1-SC006) on the seabed within the Project site that may be of marine archaeological potential. In view of the muddy/silty seabed nature and its shallow deposition on the seabed, the sonar contact is likely to be a modern and recently deposited debris that would not be of high archaeological potential.

7. Nevertheless, a buffer area of 20 m radius from the sonar contact is recommended to avoid any anchoring activities in the area. With implementation of recommended preventative measures, no unacceptable cultural heritage impacts due to construction and operation of the Project are anticipated.

Other Environmental Impacts

8. Other environmental impacts including aspects of air quality, noise, fisheries, visual impacts and waste management have been satisfactorily addressed in the EIA report and no adverse environmental impacts are anticipated. With the implementation of the recommended mitigation measures, the Project will comply with the relevant requirements of the EIA Study Brief and TM.

SPECIFIC ENVIRONMENTAL ASPECTS

Fish Culture Zone at Po Toi (Southeast)

1. The key affected environmental sensitive receivers in the vicinity of the Project site include coral communities, Finless Porpoise habitat, existing PT FCZ and the proposed new PT(SE) FCZ. No air quality and noise sensitive receivers were identified within the assessment area of the Project.

Water Quality

2. Hong Kong Southern waters is open and less affected by Pearl River estuary, with a corresponding WQO on Total Inorganic Nitrogen (TIN) of 0.1 mg/L. Under this setting, a minor project contributed change of TIN from background level of 0.12 mg/L to 0.13 mg/L were predicted at Po Toi Southeast coral communities and proposed PT(SE) FCZ.

3. These project contributed changes in TIN level to the affected sensitive receivers were on par with other proposed new FCZs. Besides, the predicted TIN level at the proposed PT(SE) FCZ is well within the national recommended level for mariculture operation of 0.3 mg/L. In addition, the main concern over nitrogen content would be eutrophication. Given the algae growth in the concerned southern waters is limited by phosphorus content, the predicted minor change in TIN level would unlikely result in adverse water quality impact to the sensitive receivers and marine waters adjoining the Project site.

4. No other non-compliance with WQO criteria were predicted. With the implementation of the key mitigation measures including control of standing stock level, mandatory use of pellet feed, and operational control measures and best practices for mariculture activities, no unacceptable water quality impact was anticipated.

Marine Ecology (Finless Porpoise)

5. Finless Porpoise (FP) usage of marine waters around Po Toi Island was relatively low as compared to offshore areas in Hong Kong Southern waters and no recorded sighting were found within the Project site.

6. No substantial marine work or other major source of pollution is expected from the construction of the Project. Only a small portion of the available habitat of FP would be affected by the Project activities. Given only limited numbers of small marine vessels such as sampans and speedboats would be involved in future mariculture operation while marine mammals are habituated to background underwater sound near Po Toi Island due to high level marine traffic, no unacceptable impact to FP was predicted.

Cultural Heritage

7. Four sonar contacts, which are modern deposit and would not be of high marine archaeological potential are identified within the Project Site. Nonetheless, buffer area with 20 m radius would be maintained during construction and operation of the Project to avoid potential impact to these objects due to anchoring activities and therefore no adverse impact is anticipated.

Other Environmental Impacts

8. Other environmental aspects including other marine ecology, fisheries, visual impact and waste management have been satisfactorily addressed in the EIA report and no adverse environmental impacts are anticipated. With the implementation of the recommended mitigation measures, the Project will comply with the relevant requirements of the EIA Study Brief and TM.