

12. CONCLUSION

12.1 General

This Environmental Impact Assessment (EIA) Report has been produced in accordance with the requirements of the EIA Study Brief (ESB-325/2019) for the Establishment of Fish Culture Zone at Outer Tap Mun and the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO).

Potential environmental impacts that have been assessed for the Project include the following aspects and are summarised in the sections below.

- Water quality;
- Marine ecology;
- Fisheries;
- Waste management;
- Visual;
- Air quality; and
- Cultural heritage.

12.2 Summary of Environmental Impacts

The summaries of environmental impacts are structured as follows for each of the technical assessment completed under this EIA study:

- Sensitive receivers / assessment points;
- Assessment Methodology and Criteria;
- Key Construction Impacts;
- Key Operation Impacts;
- Key Mitigation Measures;
- Residual Impacts; and
- Compliance with the guidelines and criteria of the *EIAO-TM*.

12.2.1 Water Quality

Table 12.1 presents a summary of the key findings of the assessment of potential impacts to water quality as a result of the construction and operation of this Project. Full details of the assessment and mitigation measures are presented in **Section 3** of this EIA Report.

Table 12.1 Summary of Environmental Assessment and Outcomes – Water Quality

Item	Description
Water Sensitive Receivers (WSRs)	WSRs were identified under this Project, covering: <ul style="list-style-type: none"> ■ Recreational areas, such as secondary contact recreation subzones of WCZs; ■ Marine Park and ARs deployed within; ■ Existing FCZs, 3 proposed FCZs and spawning ground and nursery area of fisheries resources;

Item	Description
	<ul style="list-style-type: none"> ■ Ecological habitats for marine organisms including coral and benthic communities, and Finless Porpoise at / near the Project site; ■ Artificial reefs; ■ Intertidal area; ■ Amphioxus habitat; ■ Site of Special Scientific Interest; and ■ Non-gazetted beach.
Assessment Methodology and Criteria	<ul style="list-style-type: none"> ■ The potential impacts due to the construction and operation of the Project were assessed following the <i>EIAO-TM Annex 6</i> guidelines and the impacts evaluated based on the criteria in <i>EIAO-TM Annex 14</i>. Water quality impacts on WSRs were evaluated according to the Water Quality Objective (WQO) criteria of the corresponding WCZ, additional suspended solids criterion for coral in the Tolo Harbour and Channel WCZ and chlorophyll-a criterion for FCZs in the Mirs Bay WCZ. ■ Construction phase of this Project will only involve towing; on-site assemble and anchorage of fish raft. The corresponding impacts were assessed qualitatively. ■ Impacts due to increase pollution load from mariculture activities at the Project site at Outer Tap Mun were assessed quantitatively using Delft3D suite of model. First, the carrying capacity of the Project site at Outer Tap Mun was estimated following methodology by <i>Wong et. al. 2012</i>. Project WATERMAN - Carrying Capacity of Fish Culture Zones in Hong Kong. Then the corresponding pollution load from the Project site based on the derived carrying capacity, as well as all the pollution load of fish culture zones were estimated based on the updated methodology established by <i>Wong et. al. 2012</i>. This stream of pollution load, together with other sources of pollutants in HK and the Guangdong side of the Mirs Bay, were than taken into account in the Delft3D WAQ modelling simulation to predict the change in water quality at water sensitive receivers. ■ The predicted water quality was then assessed against the relevant criteria of WQOs and / or specific water quality criterion for mariculture for compliance.
Key Construction Impacts	<p>Impacts during construction phase of the Project is expected to be very limited. Limited and localized elevation of suspended solids from anchoring activities will have transient impact on the water quality because suspended sediment will settle shortly close to the anchor. The Project site is deep enough so propeller wash would not be a concern. Construction phase would likely involve the use of modular form and pretreated materials so onsite works and use of chemicals would be minimal. This also means there would not be significant presence of workforce onsite. Any sewage / wastewater generated should be collected by the associated transportation / work boats for disposal at appropriate facilities on land.</p>
Key Operation Impacts	<ul style="list-style-type: none"> ■ Water quality simulation indicated that the predicted change in water quality due to the mariculture operation at the estimated carrying capacity of the Project site would be limited. No additional exceedance WQO were predicted at any water sensitive receivers. ■ The inclusion of integrated multi-trophic aquaculture would result in different levels of pollution reduction from the proposed mariculture operation at the Project Site by means of (1) reduction of wasted feed, fecal matters and other waste, and (2) filter feeding of plankton and biodeposition. Its implementation would positively affect the water quality at the Project Site if implemented in sufficient scale.
Key Mitigation Measures	<p>Construction:</p> <ul style="list-style-type: none"> ■ Any sewage / wastewater generated should be collected at the transportation / work vessel(s) for disposal at appropriate facilities on land.

Item	Description
	<p>Operation:</p> <p>The following precautionary measures should be implemented to minimise water quality impact from the proposed mariculture operation at the Project site:</p> <ul style="list-style-type: none"> ■ Standing should not exceed 684.5 ton at any given time. AFCD will ensure the production scale of the Project site will not exceed the maximum standing stock level by controlling the mariculture production scale permitted under individual license. ■ In case of potential circumstances (e.g. red tide event, outbreak of fish disease), the licensees will review the need of fish raft relocation and propose the fish raft relocation plan as necessary for agreement with AFCD. ■ Only pellet feed or alternative feed with better feed conversion ratio will be permitted within the proposed FCZ.. ■ No chemically-laden solution from culture gears disinfection should be discharged into the sea. ■ Onsite storage of chemicals should be controlled and minimised as practicable. Excess chemicals as well chemical waste generated should be removed from the site at appropriate facilities or by licensed contractor as soon as possible. ■ Fuel storage onsite should be minimized, and if needed, be located at sheltered and secure location. ■ Littering of the sea should be prohibited.
Residual Impacts	<p>Construction:</p> <ul style="list-style-type: none"> ■ No marine work or other major source of pollution is expected from the construction phase of the Project. No unacceptable construction phase water quality impact is expected. <p>Operation:</p> <ul style="list-style-type: none"> ■ Modelling results indicated no additional exceedance or aggravation of existing condition would be expected from the operation phase of the Project. No unacceptable operation phase water quality impact is expected.
Compliance with <i>EIAO-TM</i>	The assessment and the potential impacts are in compliance with the <i>EIAO-TM Annexes 6 and 14</i> and applicable assessment standards / criteria.

12.2.2 Marine Ecology

Table 12.2 presents a summary of the key findings of the assessment of potential impacts to marine ecology as a result of the construction and operation of this Project. Full details of the assessment and mitigation measures are presented in **Section 4** of this EIA Report.

Table 12.2 Summary of Environmental Assessment and Outcomes – Marine Ecology

Item	Description
Marine Ecological Sensitive Receivers	<p>In accordance with the Study Brief Section 3.4.4.2 of the Project, the marine ecological sensitive receivers were identified and detailed in Section 4.</p> <ul style="list-style-type: none"> ■ The Assessment Area is the same as the water quality impact assessment, which covers the Mirs Bay Water Control Zone (WCZ) and the Tolo Harbour and Channel WCZ. ■ Known marine ecological important habitats and species in the vicinity of the Project within the Assessment Areas include existing Country Parks, Site of Special Scientific Interest (SSSI), existing marine park, mangroves, seagrass beds, coral communities, marine benthos of

Item	Description
	conservation interest, and ecological important species including Amphioxus, White-bellied Sea Eagle and seagrass (<i>Halophila minor</i>).
Assessment Methodology and Criteria	<ul style="list-style-type: none"> ■ A literature review was supplemented by a programme of field surveys that covered subtidal (benthic and coral) communities. ■ The potential impacts due to the construction and operation of the proposed Project were assessed following the <i>EIAO-TM Annex 16</i> guidelines and the impacts evaluated based on criteria in <i>EIAO-TM Annex 8</i> and <i>Guidance Notes</i>.
Key Construction Impacts	<ul style="list-style-type: none"> ■ Impacts from temporary habitat disturbance (~55 ha) and underwater sound from marine construction activities and marine vessels on marine ecology and marine parks is considered minor and acceptable, therefore the implementation of mitigation measures is not required.
Key Operation Impacts	<ul style="list-style-type: none"> ■ Impacts from changes in marine habitats (<55 ha), temporary relocation of rafts under typhoons or algal blooms, underwater sound from daily operations and marine vessels, changes in water quality parameters during fish farm operation and potential introduction of invasive species on marine ecology and marine parks is considered to be minor and acceptable. ■ Water quality impacts arising from the operation of fish farms will be reduced through implementation of the recommended water quality mitigation measures. ■ The operation measures and practices presented in Appendix 2A would prevent the potential introduction of invasive species.
Key Mitigation Measures	The mitigation measures designed to mitigate impacts to water quality during construction and operation and through proper fish farm management are expected to mitigate impacts to marine ecological resources.
Residual Impacts	<p>The following residual ecological impacts have been identified:</p> <ul style="list-style-type: none"> ■ <55 ha of marine ecological habitat will be affected during operation of the FCZ. While the design of fish farm will only occupy a section of the water column and a small area of seabed, with the small extent of affected habitat and the overall low marine ecological value in the context of surrounding similar habitat, the impact due to the change in marine habitat is considered to be of minor significance and acceptable. Furthermore, with the implementation of the proposed mitigation measures, the potential impact on marine ecological resources will be further minimised. No unacceptable residual marine ecological impacts during the construction and operation of the Project are therefore anticipated. ■ In addition, the fish farm structures, which would provide artificial substrates for forming habitat and shelter for juveniles or adult fisheries, would provide positive effects on marine ecological resources within and adjacent to the Project Site.
Compliance with <i>EIAO-TM</i>	The assessment and the potential impacts are in compliance with the <i>EIAO-TM Annexes 8</i> and <i>16</i> and applicable assessment standards / criteria.

12.2.3 Fisheries

Table 12.3 presents a summary of the key findings of the assessment of potential impacts to fisheries as a result of the construction and operation of this Project. Full details of the assessment and mitigation measures are presented in **Section 5** of this EIA Report.

Table 12.3 Summary of Environmental Assessment and Outcomes – Fisheries

Item	Description
Fisheries Sensitive Receivers	<p>The identified fisheries sensitive receivers are:</p> <ul style="list-style-type: none"> ■ Recognised nursery area of commercial fisheries resources in northeastern waters located within the Project site; ■ Recognised spawning ground of commercial fisheries resources in northeastern waters which is ~4 km from the Project site; ■ FCZs at Tap Mun, Kau Lau Wan and Sham Wan (located at ~0.3 km ~0.9 km and ~2.3 km by sea distance respectively from Project site); and ■ Hoi Ha Wan Marine Park and ARs deployed within.
Assessment Methodology and Criteria	<p>A literature review was conducted to establish the fisheries importance of the area surrounding the Project. The potential impacts due to the construction and operation of the Project and associated developments were assessed following the <i>EIAO-TM Annex 17</i> guidelines and the impacts evaluated based on the criteria in <i>EIAO-TM Annex 9</i>.</p>
Key Construction Impacts	<ul style="list-style-type: none"> ■ Temporary disturbance to fisheries habitat and loss of access to fishing grounds within an area of ~55 ha at the Project site is considered to be minor and acceptable given the small size of the affected areas and the majority of fisheries resources found in and around the vicinity of the Project site are of low commercial value. ■ The impact from the construction works on fishing activity is of temporary nature. Furthermore, although the project site is largely located in an area with high level of fishing activities, the loss of access to fishing ground is considered to be relatively small compared to the availability of fishing grounds elsewhere in northeastern Hong Kong waters available for fishing activities. Overall, the impacts on fishing activity are of minor significance and no unacceptable impacts are expected. ■ Due to the presence of moderate to high background levels of underwater sound in the vicinity of the Project site, unacceptable impacts on fisheries due to the generation of underwater sound from increased marine traffic during FCZ construction is not expected.
Key Operation Impacts	<ul style="list-style-type: none"> ■ Changes in fisheries habitat and loss of access to fishing grounds will not fully occupy all of the Project area with the estimated affected area 55 ha. The impact on fisheries resources and fisheries habitat is considered to be minor and acceptable given the small size of the affected areas and the majority of fisheries resources found in and around the vicinity of the Project site are of low commercial value. ■ Relocation of fish rafts / cages would occur only temporarily and corresponding impacts would be similar to the construction phase. The impact is considered to be minor and unacceptable impacts on fisheries resources and habitats are not expected. ■ Due to the presence of moderate to high background levels of underwater sound in the vicinity of the Project site, unacceptable impacts due to the generation of underwater sound from increased marine traffic during fish farm operation is not expected. ■ Unacceptable impacts at all fisheries sensitive receivers due to changes in water quality from fish farm operation is not expected. ■ The implementation of good mariculture practices and measures presented in Appendix 2A, such as fish health surveillance program would reduce the outbreak of fish disease, unacceptable impacts on fisheries are expected to be minor.
Key Mitigation Measures	<p>The mitigation measures designed to mitigate impacts to water quality during construction and operation with proper fish farm management designated to</p>

Item	Description
	mitigate marine ecological impacts are expected to mitigate impacts to fisheries resources.
Residual Impacts	<ul style="list-style-type: none"> ■ 55 ha of fisheries habitat and fishing grounds will be affected during operation of the FCZ. While the design of fish farm will only occupy a section of the water column and a small area of seabed. With the small extent of affected area and the overall low commercial value of fisheries resources, the impact due to the change in fisheries habitat and loss of access to fishing grounds is considered to be of minor and acceptable. Furthermore, with the implementation of the proposed mitigation measures, the potential impact on fisheries will be further minimised. No unacceptable residual fisheries impacts during the construction and operation of the Project are therefore anticipated. ■ In addition, the establishment of the proposed FCZ would have positive effects on fisheries resources. While the proposed FCZ would provide more fisheries resources to the local and global fisheries market, the fish farm structures would also provide artificial substrates, which could form habitat and shelter for juveniles or adult fisheries resources. Besides, the reduced fishing pressure may also have potential positive effect on fisheries resources within and adjacent to the Project site.
Compliance with <i>EIAO-TM</i>	The assessment and the potential impacts are in compliance with the <i>EIAO-TM Annexes 9 and 17</i> and applicable assessment standards / criteria.

12.2.4 Waste Management

Table 12.4 presents a summary of the key findings of the assessment of the waste management implications associated with the construction and operation of this Project. Full details of the assessment and mitigation measures are presented in **Section 6** of this EIA Report.

Table 12.4 Summary of Environmental Assessment and Outcomes – Waste

Item	Description
Assessment Methodology and Criteria	The study methodology follows the criteria and guidelines as stated in <i>Annexes 7 and 15</i> of the <i>EIAO-TM</i> and the Requirements stated in <i>Appendix E</i> of the Study Brief.
Key Construction Impacts	General refuse will be produced by contractor(s) and floating refuse may be trapped on the surface of the anchored fish cages, fish rafts and vessels within the Project site during the construction phase. Unacceptable waste management impact arising from construction of the Project is not anticipated.
Key Operation Impacts	Operation waste are mainly comprised of organic waste, chemical waste, general refuse and floating refuse from site operation. Operation impacts are expected to be acceptable with the adoption of appropriate mitigation measures.
Key Mitigation Measures	<ul style="list-style-type: none"> ■ Nomination of approved personnel (e.g. environmental officer of the contractor(s), representative of the project proponent) to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site. ■ Training of site personnel in proper waste management and handling procedures by AFCD. ■ Provision of sufficient waste disposal points and regular collection for disposal.

Item	Description
	<ul style="list-style-type: none"> ■ Appropriate measures to reduce windblown / floating litter and dust during transportation of waste by transporting wastes in enclosed containers. ■ A recording system (e.g. log book for mariculture operation) for the amount of wastes generated, recycled and disposed of and the disposal sites for checking by AFCD. ■ Prior to the commencement construction phase and operation phase, training should be provided to contractor(s) and all staff working at the Project site respectively. ■ Proper collection, storage and disposal of solid wastes, chemical wastes and organic wastes shall be carried out under the relevant Ordinances. ■ To avoid entrapment of floating refuse within the Project site, fish cages / rafts and vessels should be properly designed to avoid or minimise any trapped or accumulated refuse. ■ Use of good quality feed, i.e. pellet feed, to reduce uneaten feed wastage. ■ The fish farmers will keep detailed operational records to allow more accurate estimation of fish feed input and to minimise unnecessary wastage of feeds. ■ The uneaten feeds should be cleaned up immediately to minimise leaching to the adjacent water.
Residual Impacts	No adverse residual impacts are expected.
Compliance with <i>EIAO-TM</i>	The assessment and the potential impacts are in compliance with the <i>EIAO-TM Annexes 7 and 15</i> and applicable assessment standards / criteria.

12.2.5 Visual Impact

Table 12.5 presents a summary of the key findings of the assessment of potential visual impact as a result of the construction and operation of the Project. Full details of the assessment and mitigation measures are presented in **Section 7** of this EIA Report.

Table 12.5 Summary of Environmental Assessment and Outcomes – Visual Impact

Item	Description
Visual Sensitive Receivers (VSRs)	A total of four VSR groups have been identified. They included recreational, residential, occupational and travelling users. Five viewpoints have been selected to assess the visual impacts.
Assessment Methodology and Criteria	<ul style="list-style-type: none"> ■ The methodology of the visual impact assessment was based on <i>Annexes 10 and 18</i> in the <i>EIAO-TM</i> under the <i>EIA Ordinance</i> and associated <i>Guidance Notes</i>. ■ The visual assessment examined the impact of the proposed development on the existing views and the visual amenity, particularly from the VSRs within the viewshed. ■ In order to illustrate the visual impacts of the proposed Project structures, photomontages prepared from selected viewpoints compare the existing conditions with the view after construction. The residual impacts are evaluated qualitatively, in accordance with the requirements of <i>Annex 10</i> of the <i>EIAO-TM</i>.
Key Construction Impacts	Visual impacts during construction of the Project are considered acceptable with mitigation.

Item	Description
Key Operation Impacts	Operational impacts are expected to be acceptable and arise from the operation of the new structures of the Project site. Night-time lighting for night-time navigation and glare impact is considered acceptable.
Key Mitigation Measures	<ul style="list-style-type: none"> ■ Pre-construction and construction period for the Project site should be reduced as far as practical to lower visual impact. ■ The new structures will be designed in accordance with relevant marine safety standards and regulations. Sensitive architectural design will be considered where practicable. This should take into account material texture, colour, finishes to structures to ensure the fish rafts / cages blend into the existing context, cause least disturbance to the existing seascape, and are the most visually appealing. ■ After operation, the open water occupied by the Project site will be reinstated to their former state. ■ Light intensity and beam directional angle should be controlled at the Project site at the design stage to reduce light pollution and glare (e.g. hooded lights, specific directional focus, etc.).
Residual Impacts	No significant adverse visual impacts are expected.
Compliance with <i>EIAO-TM</i>	The assessment and the potential impacts are in compliance with the <i>EIAO-TM Annexes 10 and 18</i> and applicable assessment standards / criteria.

12.2.6 Air Quality

Table 12.6 presents a summary of the key findings of the assessment of potential impacts to air quality as a result of the construction and operation of the Project. Full details of the assessment and mitigation measures are presented in **Section 8** of this EIA Report.

Table 12.6 Summary of Environmental Assessment and Outcomes – Air Quality

Item	Description
Air Sensitive Receivers (ASRs)	The Assessment Area is defined as an area within 500 m from the Project site boundary as stated in Section 3.4.8.2 of the Study Brief. Two representative ASRs have been identified within the Assessment Area.
Assessment Methodology and Criteria	<p>The principal legislation for the management of air quality in Hong Kong is the <i>Air Pollution Control Ordinance (APCO) (Cap 311)</i>. As the new set of Air Quality Objectives (AQOs) has come into effect since 1 January 2022, the new AQOs were used as the assessment criteria for this assessment.</p> <p>A maximum hourly TSP level of 500 $\mu\text{g m}^{-3}$ at ASRs is also stipulated in Annex 4 of the <i>EIAO-TM</i> to assess potential construction dust impacts. The measures stipulated in the <i>Air Pollution Control (Construction Dust) Regulation</i> should also be followed to ensure that any dust impacts are minimised.</p> <p>Requirements stipulated in the <i>Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation</i> and <i>Air Pollution Control (Fuel Restriction) Regulation</i> will be followed to control potential emissions from non-road mobile machinery.</p> <p>Requirements stipulated in the <i>Air Pollution Control (Marine Light Diesel) Regulation</i> and <i>Air Pollution Control (Fuel for Vessels) Regulation</i> will be followed to control potential marine vessel emissions.</p>
Key Construction Impacts	Minor emissions from small marine vessels and construction equipment were identified during the construction phase of the Project. Due to the small-scale construction works, and sufficient separation distance between the

Item	Description
	Project site and the nearest ASR, no adverse air quality impact arising from the construction works of the Project is anticipated.
Key Operation Impacts	Minor emissions from small marine vessels and small power generators were identified during the operation phase of the Project. Due to the small-scale operational activities, and sufficient separation distance between the Project site and the nearest ASR, no adverse air quality impact arising from the operation of the Project is anticipated.
Key Mitigation Measures	Requirements stipulated in the <i>Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation</i> and <i>Air pollution Control (Fuel Restriction) Regulation</i> will also be followed to control emissions from construction equipment during construction and power generators during operation. In addition, requirements stipulated in <i>Air Pollution Control (Marine Light Diesel) Regulation</i> and <i>Air Pollution Control (Fuel for Vessels) Regulation</i> will be followed to control potential emissions from marine vessels.
Residual Impacts	No adverse air quality impact is anticipated to arise from the construction and operation of the Project and thus there would be no residual air quality impact during the construction and operation phases of the Project.
Compliance with EIAO-TM	The assessment and the potential impacts are acceptable and in compliance with the <i>EIAO-TM Annexes 4 and 12</i> and applicable assessment standards / criteria.

12.2.7 Cultural Heritage

Table 12.7 presents a summary of the key findings of the assessment of potential impacts to cultural heritage as a result of the construction and operation of this Project. Full details of the assessment and mitigation measures are presented in **Section 9** of this EIA Report.

Table 12.7 Summary of Environmental Assessment and Outcomes – Cultural Heritage

Item	Description
Cultural Heritage Sensitive Receivers	Three sonar contacts (B-SC001, B-SC011 and B-SC021) that may be of marine archaeological potential identified in the Assessment Area. Nevertheless, because of the muddy / silty seabed, objects such as cannon would sink into the seabed, the three sonar contact are most likely to be modern, recently deposited objects that would not be of high archaeological potential.
Assessment Methodology and Criteria	The study methodology follows the criteria and guidelines as stated in <i>Annexes 10 and 19</i> of the <i>EIAO-TM</i> and the Requirements for MAI as stated in <i>Appendix H</i> of the Study Brief.
Key Construction Impacts	Potential direct impact on sonar contacts B-SC001, B-SC011 and B-SC021 that may have marine archaeological potential is identified due to tug boat anchoring and anchoring of fish rafts / cages as the seabed will be disturbed by the anchoring but confined to a thin vertical surface layer (<0.5 m) , and <2 m horizontally.
Key Operation Impacts	Potential direct impact on sonar contacts B-SC001, B-SC011 and B-SC021 due to relocation of fish cages / rafts that may be of marine archaeological potential is possible.
Key Mitigation Measures	A radius of 20 m buffer area from each of the sonar contacts (B-SC001, B-SC011 and B-SC021) to avoid any tug boat anchoring and anchoring of fish rafts/cages in the areas during construction phase. The locations and relocations of fish rafts / cages are regulated by the <i>Marine Fish Culture Ordinance (Cap. 353)</i> , and AFCD will ensure the locations of

Item	Description
	anchoring of vessels and fish rafts/cages will not be located within the buffer area during construction phase. AFCD will conduct regular site inspections during operation phase to check if any seabed disturbance work is conducted in the buffer area.
Residual Impacts	No adverse residual impacts are expected.
Compliance with <i>EIAO-TM</i>	The assessment and the potential impacts are in compliance with the <i>EIAO-TM Annexes 10 and 19</i> and applicable assessment standards / criteria.

12.3 Documentation of Key Assessment Assumptions, Limitation of Assessment Methodology and Related Prior Agreement(s)

A summary of key assessment assumptions, limitation of assessment methodologies and related prior agreements with relevant Government Departments is presented in **Table 12.8**.

Table 12.8 Key Assessment Assumptions, Limitation of Assessment Methodologies and related Prior Agreement(s) with the Relevant Authorities

Environmental Aspect	Key Assessment Assumptions	Limitation of Assessment Methodologies	Prior Agreement(s) with the Director of Environmental Protection or other Authorities
Water Quality	<p>Water quality baseline developed based on available EPD water quality monitoring data within Assessment Area in 1986-2020.</p> <p>Pollution loading inventory in Hong Kong was developed based on available planning data, latest information for sewerage and other infrastructure and followed the established approach adopted in previous Hong Kong studies.</p> <p>Future year of 2023 was chosen to develop baseline scenario as the future pollution loading from the Guangdong Province of China. Pollution load from the Guangdong Province is expected to decrease continuously and therefore the estimated loading in 2023 are assumed for conservative assessment (Section 4 of Appendix 3A referred).</p> <p>Pollution load from mariculture practice was estimated based on accepted methodology from previous fish culture zone studies. A conservative feed conversion ratio of 2 was adopted for estimation of pollution load.</p>	<p>Potential change in pollution loading from Guangdong side of Mirs Bay and potential change in mariculture practice which leads to different level of pollution loading from fish farms. Conservative assumptions were adopted to ensure these uncertainties are properly covered.</p> <p>Modelling exercise simulates only typical conditions of dry season and wet season, which is generally considered acceptable.</p>	<p>In accordance with <i>Clause 3.4.3</i> and <i>Appendix B</i> of the Study Brief, a Water Quality Modelling Plan was submitted for agreement by the Director of EPD. Agreement was received from EPD on 14 October 2022.</p>
Marine Ecology	<p>Assessment was conducted based with literature review supplemented with focussed field surveys within the Assessment Area, including subtidal (benthic and coral) surveys.</p>	N/A	<p>Methodology Paper for Marine Ecological Survey was submitted to AFCD for agreement prior to the survey. Agreement was received from AFCD on 25 September 2020.</p>
Fisheries	<p>Assessment was conducted based on literature review of past fisheries studies, AFCD's Port Survey and recent fisheries surveys of the approved EIA studies.</p>	N/A	<p>Methodology Paper for Fisheries Impact Assessment was submitted to AFCD for agreement prior to conducting the literature review. Agreement was</p>

Environmental Aspect	Key Assessment Assumptions	Limitation of Assessment Methodologies	Prior Agreement(s) with the Director of Environmental Protection or other Authorities
			received from AFCD on 25 September 2020.
Waste Management	Volume of general construction and operational waste were estimated based on the latest design information available from AFCD at the time of reporting.	N/A	N/A
Visual	Photomontages were prepared with reference to the typical fish farm. Colours of fish farm structures may be subject to change at detailed design stage.	Assessment of magnitudes of change caused by the Project works to visual sensitive receivers are inherently subjective.	N/A
Air Quality	The air quality impact assessment was conducted qualitatively with reference to the prevailing AQOs and based on the latest project information provided by AFCD at the time of reporting.	N/A	N/A
Cultural Heritage	The Marine Archaeological Investigation (MAI) was conducted based on the literature review of past projects and supplemented by a marine geophysical survey within the Assessment Area to fill in information gaps.	N/A	N/A

12.4 Summary of Development Options and Alternative Mitigation Measures Considered

Viable sites of the Project have been considered during the Project's Feasibility Study, based on the environmental benefits and dis-benefits for the construction and operation of the new FCZs. Various development options are reviewed and considered in this EIA study. The environmental benefits and dis-benefits of the development options and alternative mitigation measures are summarised in **Table 12.9**. Outer Tap Mun is one of the proposed sites which met the selection criteria for new FCZs and is sited to avoid encroaching sensitive receivers (e.g. ecologically important habitats, areas of high fisheries importance). To further minimise potential impacts, the Project site will adopt modernized and advanced type of aquaculture technologies and operate within the maximum standing stock as identified in this EIA study.

Table 12.9 Summary of Environmental Benefits and Dis-benefits of the Development Options and Alternative Mitigation Measures Considered for the Project

Development Options	Benefits	Dis-benefits
<p>Project Siting</p> <p><u>Preferred Option</u> Site selection of sustainable mariculture with reference to international guidelines, which include minimum water depth, wave exposure, water quality and the compatibility with the existing usage and environment</p>	<ul style="list-style-type: none"> ■ Avoid encroaching into ecological sensitive receivers e.g. marine reserves, coral habitats of high ecological value and areas of high fisheries importance, thus avoid impacts to marine ecology and fisheries ■ Better water flushing rate for mariculture to allow adequate water dispersion and prevent the build-up of organic content and degradation of the nearby marine environment. Consequently, organic content is also not built up on the seabed and maintenance dredging and sediment removal are therefore not required for FCZ in deep waters, and the associated water quality impacts and related ecological and fisheries impacts can be avoided ■ Remote area at Outer Tap Mun minimises impacts on air quality, noise, and visual sensitive receivers 	<ul style="list-style-type: none"> ■ May pose potential environmental impacts to newly affected areas. However, careful site selection and fish farm design have been done to avoid / minimise potential impacts
<p><u>Alternative Option</u> Expanding existing FCZs</p>	<ul style="list-style-type: none"> ■ Limit environmental impacts to areas that are already affected by existing FCZs 	<ul style="list-style-type: none"> ■ Development constrained by existing marine usage and nearby ecological sensitive receivers. Water flushing rate is generally lower due to inshore and shallow waters of the existing FCZs. Impacts to water quality, including restricted dispersion and accumulation of organic loading due to FCZ operation, are likely to occur when more mariculture production is necessary to support the development of mariculture in Hong Kong. ■ Sediment removal may be required periodically to maintain a suitable environment for mariculture. The environmental impacts are likely to be more detrimental

Development Options	Benefits	Dis-benefits
<p>Project Size / Scale</p>		
<p><u>Preferred Option</u> Establishment of smaller FCZ at different locations</p>	<ul style="list-style-type: none"> ■ Establishment of smaller FCZs to reduce the organic loading at individual site, to minimise impact to coral communities and habitat for marine ecological and fisheries resources. ■ With sufficient clearance to navigation routes, accidents / collision of marine vessels with fish farm facilities, and potential risk of fish escape and introduction of invasive species to the marine environment can be minimised. 	<ul style="list-style-type: none"> ■ Affect more areas with potential environmental impacts but better control of impact intensity to within relevant criteria
<p><u>Alternative Option</u> Establishment of a single larger FCZ</p>	<ul style="list-style-type: none"> ■ Limit environmental impacts to single location but with higher intensity 	<ul style="list-style-type: none"> ■ The pollution loading from mariculture operation will concentrate in a particular area. The potential impacts to water quality, marine ecology and fisheries of the surrounding waters are expected to increase.
<p>Fish Farm Layout and Design</p>		
<p><u>Preferred Option</u> Use of advanced mariculture fish farm designs (e.g. HDPE cages, steel stuss cages)</p>	<ul style="list-style-type: none"> ■ Durable and weather-resistant material would less likely to get damaged or repaired and result in less waste generated. ■ Less susceptible to damage during adverse weather condition, such as typhoons, and minimise potential risk of fish loss / escape, and subsequent impact on local ecology and fisheries; and also minimise impact due to fish cage relocation. 	<ul style="list-style-type: none"> ■ Higher setup cost

Development Options	Benefits	Dis-benefits
	<ul style="list-style-type: none"> ■ Adequate water flow and dispersion of organic content between cages / rafts, and along the water column is allowed. Adequate clearance from seabed will also be maintained. Water quality impacts such as changes in flow regime and build-up of organic content are minimised. Subsequent ecological and fisheries impacts in the vicinity and degradation of the nearby marine environment could be reduced. The need for maintenance dredging and sediment removal during construction and operation of the Project is also avoided. ■ Use of green technology and automation could reduce feed wastage and physical labour, hence reduce potential disturbance to water quality, ecology and environment from feed wastage, workforce wastes, vessel trips, etc. 	
<p><u>Alternative option</u> Use of traditional fish farm designs (e.g. made of timber supported by floating units made of empty plastic drums or polystyrafoam floats)</p>	<ul style="list-style-type: none"> ■ Lower setup cost 	<ul style="list-style-type: none"> ■ Non-weather resistant materials and easy to get damaged or repaired. More wastes are expected to be generated. ■ Susceptible to damage from adverse weather conditions such as typhoons. Potential risk of fish loss / escape is higher, and subsequent impact on local ecology and fisheries; and also impact due to fish cage relocation would increase. ■ Potential impact on water flow and dispersion of organic content between cages / rafts, and along the water column might be present, and result in the build-up of organic content on seabed. Maintenance dredging and sediment removal may be required periodically and water quality impacts would arise. Subsequent ecological and fisheries impacts in the vicinity and

Development Options	Benefits	Dis-benefits
		degradation of the nearby marine environment would also increase. Other mitigation measures will be required to control and minimise impacts to water quality, such as the use of silt curtains, closed grab dredger, etc. <ul style="list-style-type: none"> ■ Require more labour input and hence increase potential disturbance to ecology and environment from feed wastage, workforce wastes, vessel trips, etc.
Construction Methods and Sequence of Works for the Project		
<u>Preferred option</u> Fish farm framework are pre-fabricated off-site, then assemble and anchored on-site	<ul style="list-style-type: none"> ■ Minimisation of construction duration on-site and hence reducing the duration when potential impacts to the environment can occur. ■ No generation of C&D materials on-site and potential water quality impact from construction site run-off during the construction of the Project is avoided. The use of silt curtain and construction boats for silt curtain deployment are therefore not required, the subsequent impacts to marine and fisheries habitats such as underwater sound from marine vessels are minimised ■ Less labour input required on site would result in reduction of waste generated from human activities 	<ul style="list-style-type: none"> ■ N/A
<u>Alternative option</u> No alternative option applicable as the fish farm framework used for advanced type of mariculture is large in scale, and could not be constructed from raw materials on site.	<ul style="list-style-type: none"> ■ N/A 	<ul style="list-style-type: none"> ■ N/A

12.5 Environmental Monitoring and Audit

The construction and operation activities of the proposed Project has been demonstrated in this EIA Report to comply with the *EIAO-TM* requirements. Actual impacts during the construction and operation activities will be monitored through a detailed Environmental Monitoring and Audit (EM&A) programme. Full details of the EM&A programme are presented in the ***EM&A Manual*** attached to this EIA Report. This programme will provide management actions and mitigation measures to be employed should impacts arise, thereby ensuring the environmental acceptability of the construction and operation activities of this Project.

12.6 Environmental Outcomes

No unacceptable residual impacts have been predicted for the construction and operation activities of this Project. It must be noted that for each of the components assessed in this EIA Report, the assessments and the residual impacts have all been shown to be acceptable and in compliance with the relevant assessment standards/criteria of the *EIAO-TM* and the associated *Annexes*.